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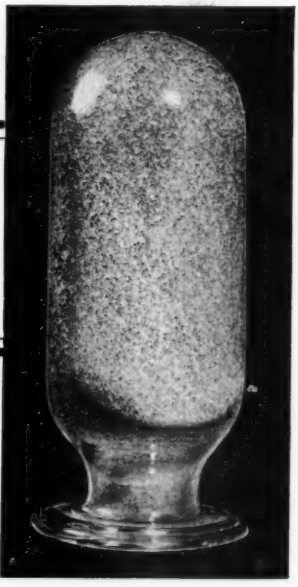

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

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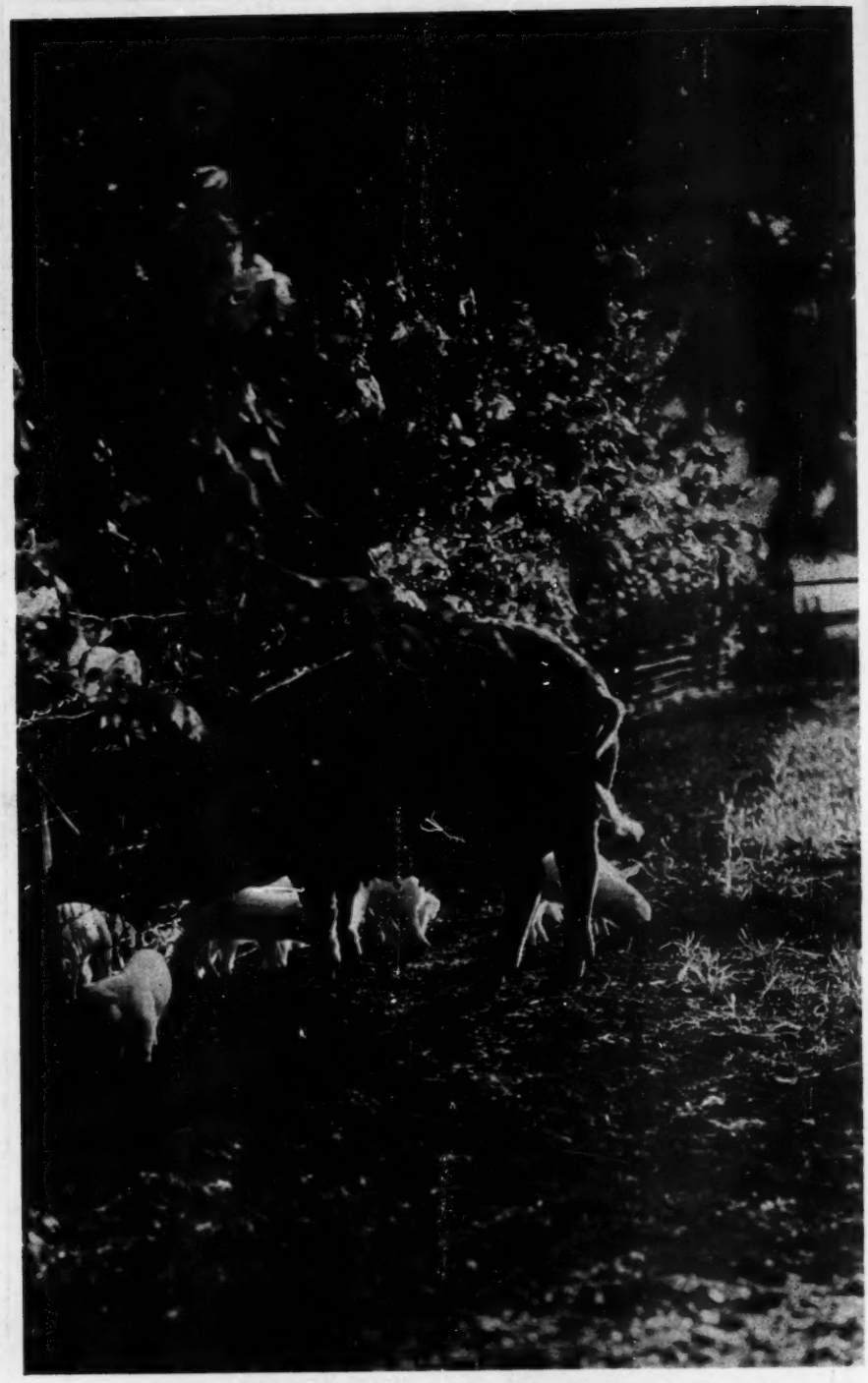

THE SEARCH FOR "GREEN PASTURES" BEGINS EARLY.

Better Crops with Plant Food

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Vol. XX WASHINGTON, D. C., MAY 1936 No. 9

A Discussion of Poetic Moods—

Spring Song

Jeff McDermid

THE vernal urge to bust out into verse usually carries its own immunity to those for whom its perusal is intended. Spring on the farm is such a busy season that actions in overalls speak louder than words in meter. Hence the punishment falls mostly on the readers who are paid for their pains, like editors, schoolma'ams, and postmasters.

In my rasher moments I have considered the plan of doing a Walt Mason piece of prancing prose for the edification of my essay classes, now scattered from Palo Alto to Penobscot; but even hardened criminals oft have their qualms of conscience and their modicum of forbearance.

Reinforced with that bulky handbook for the poem foundry known to the ancients as Walker's rhyming dictionary, no doubt your tormentor of many pages could have scattered iambics, dactyls, and spondees on paper better suited for potassium and photosynthesis. But as my contract calls for the relatively strait-jacket of prosody, I shall not violate its sanctity or victimize our cash customers by any disguised attempts to lead them into the realms of rhyme in cunningly contrived sentences arranged in ordinary paragraphs.

I have wondered betimes why amateur poetic effusions are irrevocably associated in the public mind with the spring equinox. Searching the signs of the zodiac in my swamp-root al-

manac yields me no cogent reason, so I fall back upon perusal of other authorities or perchance on my own conjectures. It sums up something like this, to wit:

The languorous climate in which the romantic and vocal Latin races abound is one long period of idyllic nature; while we of the temperate zones are besieged for almost nine months of the year by weather conditions which keep us constrained, cramped, and chilled. Thereupon, at the first signs of the north-bound sun and its summons to arboreal delights, we lav away our roast beef and smoking punch-bowls and proceed to live on garden salads washed down copiously with bock beer. This change of weather and diet and the simultaneous change from ankle-lengths to knee-shorts combine to arouse the latent and winter-benumbed impulses which soon find glorious outlet in scribbled sentiments.

No matter about the technical quality of the product. This is no course in the art of articulation in the merry month of May. If only those who *can* sing did all our singing, it would indeed be a solemn and a relatively quiet world. We have too long allowed athletics and sports to get into that stilted professional state of affairs. We have seldom played ourselves, on the grounds that the experts could play much better. I hold that it's better to play or sing or write poetry ourselves as the mood hits us than to reserve those pleasures entirely to the big leaguers.

REMEMBER, I defend the taking part in sports, song or poetry for their own sake. Of course, the audience or the reader presents a different and, in this connection, usually an heroic picture. I freely admit that seeing an amateur ball game is a bit more entrancing than scanning a volunteer tyro's verse or enduring amateur concerts.

But then, after the agony is over, ask yourselves these two pointed questions: No. 1, Why do people who are not poets or ball players try to write poetry or play baseball? No. 2, Why do people who are reputed to be excellent poets or cagey ball players frequently fail to write good poetry or play good ball?

I maintain that both are so clearly excusable as manifestations of human vanity and vagary that we must resign ourselves to fate and accept them, until some politician or Federal judge gives us relief through statute or injunction.

AS a reason for using poetry as a subject when there are so many weighty economic problems begging for my attention, I advance the claim that there are more otherwise sane people engaged in writing poetry than many of us dare admit; and by this I do not mean the kind of verse that smudges the wash-rooms in railroad depots, signed "Oklahoma Oscar."

Before me as I spoil good paper there lie about twenty verses done to a turn by an Irish farmer who emerges from a hard winter of frozen spuds and high taxes with the usual burst of bucolic fervor on farm life's compensations. It has four lines to a verse and is arranged like poetry commonly is constructed, but beyond that I have reserved a few wholesome doubts, albeit I am not a literary critic. Only three of the stanzas are appended by way of partial experiment before the gong:

"The farmer's life is a hard one,
It sure is no joke,
If he don't watch his points
He is apt to go broke.

"It can't be denied he has compensations
That make it worth while,
Tho in raiment neither he nor his wife
Can follow the style.

"Of course, the farmer needs money, with
The interest and mortgage to pay,
To help him 'tis puzzling the best minds
To find the right way."

At least for the last stanza, we can all testify that there is indeed "more truth than poetry." I know he thoroughly enjoyed putting this all down on paper just as much as I do reproducing a fraction of it, and I believe there is a vast deal of saving grace in

doing that rather than committing mayhem or grand larceny in revenge for the things he missed.

So much for the kind of folks who write poetry without a license. Next, as outlined, I turn to the licensed poets, the laureates of our land, who sometimes vex us by jobs which seem tedious, awkward, outre, and supererogatory, to say the least. They, too, sometimes strike out!

Take this poem of two lines entitled "The Ranger's Hound Dog" by a noted American "free verse" writer, as taken from his bound works in almost any library, namely: "Guarding the shack from poacher and thug, the hound dog sits on the bearskin rug." That's all to the poem, if such it be.

Then a famous woman poetess of the Imagist school writes on Whitechapel thus: "Soot, mud, noise, iron, smoke; iron, iron, iron." And of an orchestra overture, she says:

"Thin-voiced, nasal pipes
Drawing sound out and out
Until it is a screeching thread,
Sharp and cutting, sharp and cutting;
It hurts
Whee-ee!
Bump, bump, tongti-bump,
There are drums here banging."

That was no doubt the precursor of the jazz-band song about the music going 'round and 'round and coming out here, but it never attained such popular favor somehow.

Robert Frost, the New England poet, has really outdone some of my humble neighbors in their metrical evenings after chore time, when he describes a wood-pile with mathematical accuracy, thus:

"It was a cord of maple, cut and split,
And piled, four by four, by eight."

In closing out my job-lot of remnants one last gem from a modern celebrity is submitted—one complete poem called "The Well":

"He found it very cold and deep,
With a queer niche in one of its walls,
From which he hauled forth buckets of bricks and dirt."

There must be some reason why, next to Tennyson, Whittier, and Longfellow, the western versifiers like Riley, Field, and Guest "take holt" of plodding people a little tighter than do the modern purveyors of real imaginative, classical, accepted, certified, and water-marked Poetry, with a capital letter. Yea, this statement is heresy and displays a maudlin mind with no conception of how deep the Victorian poets sunk when measured in the standards of Greenwich Village or other cubistic, communistic, or impressionistic culture centers.

To many of the devotees of ultra-modern poetry one must be drunk to drink in their meaning, and like the topsy-turvy paintings by their fellow sufferers in the arts, one should tie up

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Potash for Cotton Wilt and Rust in South Mississippi

By Dr. L. E. Miles

Agricultural Experiment Station, State College, Mississippi

COTTON wilt, caused by *Fusarium vasinfectum,* is without doubt the most important disease of cotton in the United States and causes the largest annual loss to that crop. It is coextensive with cotton culture in this country, with the exception of certain localities characterized by heavy soil types, as for instance, the waxy, black lands of Texas and parts of the Mississippi Delta. Even on those soil types it is found to occur occasionally, though on such the damage caused is usually of minor consequence. The trouble also occurs in several other important cotton-growing countries of the world and in those, as in the United States, the resulting losses are high.

In 1892, George F. Atkinson, then at the Alabama Experiment Station, first called attention to the disease. His description of the symptoms of wilt, rust, root-knot, and other troubles of cotton was so simple and accurate that it has served as a basis for all work done on those diseases in this country since its publication. It has been clearly evident to every one concerned, including the growers, since Atkinson first called attention to it, that cotton wilt is commonly more prevalent and destructive on the lighter soil types. This is amply demonstrated by a consideration of its distribution in Mississippi. Scarcely a field can be found in the southern and central sections and in the interior portions of the northern section, in which the disease cannot be observed. These areas are all characterized by soils which are rather light in texture.

The rust disease, frequently designated since the work of Atkinson as potash hunger, is coextensive in distribution with wilt and is usually found occurring in the same fields. Experiments of Atkinson and later workers have clearly demonstrated that ample applications of potash will completely control rust and will entirely eliminate the damage and loss in yield caused by it. This fact, together with the concurrence of wilt and rust on the lighter soil types, has influenced many in the belief that wilt is a disease of weakened, devitalized, or undernourished plants. The fact, again first called to attention by Atkinson and later confirmed by other workers, that infestation with nematodes was a predisposing factor to severe wilt damage undoubtedly played a part in establishing this belief.

Many growers have maintained for years that fertilizers containing potash have a beneficial effect in the control of cotton wilt. This was long held as one of the "superstitions" of practical growers by the so-called initiated, who knew that the disease was caused by an organism and who consequently sought for control measures along the orthodox and established lines of investigation which had previously been productive against diseases of the same type. As has been

found on other occasions, however, such "superstitions" frequently have a substantial basis in solid fact, if only one digs deep enough to find it.

A number of workers have made some investigation of the effect of fertilizers on cotton wilt in past years, but the evidence secured has been contradictory. In 1907 Fulton in Louisiana reached a conclusion that fertilizers had no effect on wilt. Orton, working in the light soils of the southeastern states, in 1907 stated that wilt is "not due to the continued use of commercial fertilizers, nor to the exhaustion of any element of plant food." In 1908 he stated that he found no benefit for wilt control from any type of commercial fertilizer. He pointed out, however, that efforts to control wilt by other measures were frequently rendered negative by the presence of nematodes. The probable presence of severe infestations of nematodes undoubtedly detracts from the results secured from his tests with commercial fertilizers. Lewis in 1911 studied the effects of fertilizers on the disease in Georgia and came to the conclusion that none of them were of any benefit in combating it. However, his plats were not replicated, and there is evidence in his paper that the presence of nematodes might have been a disturbing factor in his experiments as well.

On the other hand, Rast, a plant-breeder in Arkansas, taking cognizance of the firmly held belief of many growers in the beneficial effect of potash in 1922, reported highly successful results from the use of kainit both in controlling wilt and in increasing yields. Neal in 1927 secured evidence from pot and field tests conducted at the Mississippi Experiment Station that potash might be beneficial in the control of wilt. In 1928 he reported that field tests conducted both in north-central Mississippi and at Poplarville in south Mississippi showed a marked reduction in the incidence of wilt when fertilizers were used, particularly those containing some form of potash.

From these data, available at the inception of the work reported herein, it appeared that there was a decided lack of unanimity of opinion with respect to the effect of fertilizers on cotton wilt. For this reason it was decided to continue the work begun by Neal and to follow up the leads which he had initiated, following the

A bad wilt spot. This needs a wilt-resistant variety of cotton and ample amounts of a fertilizer high in potash.

TABLE I.—EFFECT OF POTASH ON COTTON WILT AND YIELD OF SEED COTTON AT THE POPLARVILLE BRANCH EXPERIMENT STATION IN 1929 AND 1931-33

Treatment Lbs. per acre	1929		1931		1932		1933	
	% wilt	Lbs. seed cotton	% wilt	Lbs. seed cotton	% wilt	Lbs. seed cotton	% wilt	Lbs. seed cotton
Check—No fertilizer	23.4	400.5	34.6	211	16.6	107	13.5	320
N-200 P-400 K-0	45.8	1,269	56.5	1,017	21.1	346	22.5	1,294
N-200 P-400 K-50	17.6	1,458	17.0	1,058	6.0	343	8.5	1,890
N-200 P-400 K-100	2.6	1,728	3.0	1,224	10.7	378	4.7	1,949
N-200 P-400 K-150	4.3	1,692	6.3	1,237	10.4	404	5.7	1,940

TABLE I-a.—FOUR-YEAR AVERAGE (SUMMARY OF TABLE I)

Treatment Lbs. per acre	% wilt	Lbs. seed cotton	Av. % decrease in wilt infection	Av. % increase in yield
Check—No fertilizer	22.02	259.6	—42.35	—73.54
N-200 P-400 K-0	36.5	981.5	.....	.....
N-200 P-400 K-50	12.3	1,187.3	—65.18	+ 20.96
N-200 P-400 K-100	5.30	1,319.7	—86.12	+ 34.45
N-200 P-400 K-150	6.70	1,318.2	—82.46	+ 34.30

suggestive work of Rast with respect to the effect of potash. Accordingly, a series of field tests were begun on various soil types in different parts of the state, in which the effects of potash used alone and in combination with other fertilizer elements were tested with regard to wilt control. These tests extended from 1928 through 1934, some for shorter periods and others throughout the entire time. On account of limitations of space only those conducted on the light, sandy soils of south Mississippi will be discussed at this time.

A test was begun in 1929 to determine the effect of varying amounts of potash in a mixed fertilizer on the control of wilt and on the yield of seed cotton at the Poplarville Branch Station. It was omitted in 1930 but resumed in 1931 and continued through 1933. The variety, Lone Star 65, which shows only a moderate degree of resistance to wilt, was planted on heavily and uniformly infested soil which was of a light sandy nature, of low water-holding capacity, and of a low natural fertility. The fertilization applied is indicated in Table I, which presents the results secured over the 4-year period in which the test was conducted. The nitrogen used was in the form of nitrate of soda, the phosphorus was derived from superphosphate, and the potash from muriate of potash.

It is clearly evident from an examination of the table, that with the

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Renovating Pastures

By Arthur O. Braeger

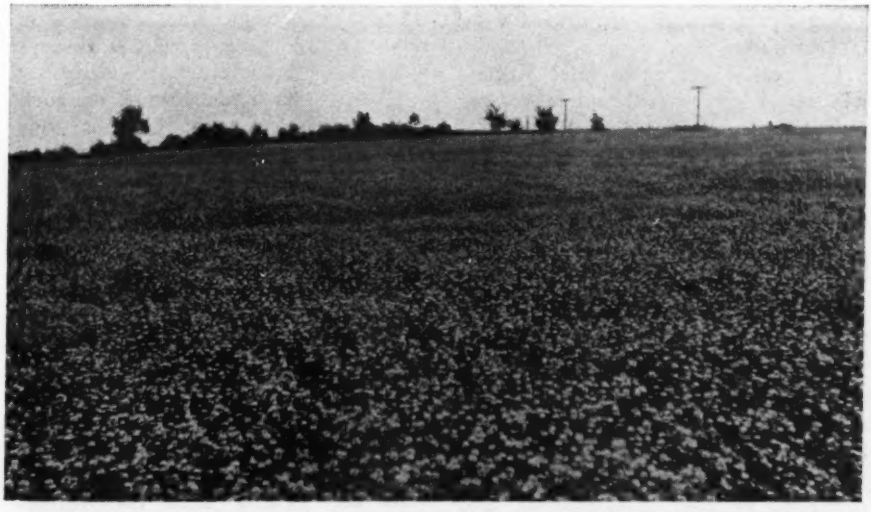
Wisconsin College of Agriculture, Madison, Wisconsin

"LIME, phosphate, and potash for pastures is proving a good slogan," declare crop specialists at the Wisconsin College of Agriculture, who have had years of experience in helping farmers solve their pasture problems.

Bluegrass, the hardy pasture grass which covers over 100,000,000 acres in the north-central and eastern states, is especially in need of help, says L. F. Graber, professor of agronomy. He maintains that declines in soil fertility, drought, over-grazing, and white grubs have severely injured this once hardy grass, especially in pastures in southern and western Wisconsin.

The renovation of such pastures consists of establishing dry-weather legumes—sweet clover, alfalfa, and red clover—in bluegrass sods without plowing, Graber has found. By disking and cultivating, the legumes are seeded without serious hazards of erosion. Once established in bluegrass sods, these dry-weather legumes repel egg-laying June beetles, eliminate weeds, and provide nitrogen to thicken and promote the growth of the grass. In addition they enhance the production of the pasture and supplement it with succulent growth when bluegrass becomes dry and tough from summer drought.

But such a plan can succeed only if the soil has an abundance of lime, phosphate, and potash, either naturally or by application, Graber declares. They help make clovers succeed. He suggests that farmers have the soil tested to find out if it needs



Where white clover grows like this, renovation with dry-weather legumes is not needed.

either lime, phosphate, potash, or any combination of these soil-building materials for the abundant growth of the three dry-weather legumes, and believes in applying fertilizers, as needed, before cultivating the sod. He would proceed as follows:

This wet, boggy pasture will produce canary grass when potash is applied.

Burn off accumulations of old grass and weeds with care.

Cut up the sod thoroughly with a disk soon after the frost is out of the ground and when it is dry enough to work up well.

Level and smooth soil with a harrow.

Sow as early as possible in the spring—preferably before sowing oats. Use no nurse crop.

Disk early and again later if ragweeds and horseweeds, and others are plentiful.

Inoculate the seed before sowing.

Seed heavily, as 20 to 25 pounds per acre are not too much.

Harrow or roll in the seed after seeding.

Fence the seeded area.

Regulate grazing of the young legumes by removing cattle when the first abundant fall rains occur.

Use biennial sweet clover. It is the cheapest and safest legume to sow on light, thin, or stony soils.

"In 1934, a year of most intensive drought, 14 old, grub-injured, and weedy bluegrass pastures were selected in southern and western Wisconsin for renovation," Mr. Graber says. "Permanent pasture areas from 3 to as much as 22 acres were fenced, limed, and fertilized as needed and then disked, harrowed, and seeded to dry-weather legumes in April and May. Unprecedented heat and drought prevailed, yet the legumes pulled through with excellent stands. In only two instances did the seedings fail, and they were reseeded that same season with remarkable success. In 1935 12 additional pastures were renovated without a single failure. Prior to 1933, three pasture areas in southwestern Wisconsin were successfully renovated and grub-proofed with dry-weather legumes."

There is no need to work on good pastures, according to Graber. But relatively few pastures will qualify as such. Many of them are weedy, unproductive, thin-sodded, grub-injured, and without clover. These are the ones that need help.

"It would be useless to attempt to establish dry-weather legumes in any pasture without liming and without fertilization, where the soil was seriously lacking in mineral requirements. Lime, phosphate, and potash as needed had best be put on the pasture just before the sod is scarified in preparation for seeding with dry-weather

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Morgan's Method

By W. B. Ward

Extension Horticulturist, Purdue University, Lafayette, Indiana

RAY MORGAN, Knightstown, Ind., is a potato grower. We might go further and say that he is a good grower of quality potatoes, as year in and year out his yields have been around 200 bushels per acre. Occasionally, scab, wireworms, and weather held the "winning hand," and consequently the yield was reduced.

Mr. Morgan has always taken an active part in Indiana's potato program, learning from this one or that one, telling his experience to others, and when some new practical idea came to his attention a conference was called to see whether or not this new practice could be worked into his potato program.

A few years ago Dr. Bushnell, from Ohio, talked before our Indiana potato growers upon the aeration of soils. He thought all soils should have more air in them for best results and went into great detail regarding this soil-improving theory. Results in Ohio favored corn as a green-manure or soil-improving crop for potatoes, particularly upon the heavier soils similar to those of central and southern Indiana. Morgan has ever been sold upon any soil-improvement program for his farm and has kept up the fertility far better than most farmers. This corn idea appealed to him, so in 1934 plans were made to include the corn green-manure crop as part of his program for his next year's potato crop or for the 1935 season.

A field that was well drained and contained about 20 acres was selected. This field had been in potatoes several years before and produced about 200 bushels of potatoes and 100 bushels of corn per acre during the corn rotation. The soil test upon this field indicated that it was slightly acid, pH 6.7, and high in available phosphoric acid and potash.

This field was planted to corn during the early summer of 1934, six pecks drilled in per acre. About September 1, when the corn had become fully grown and while in a more or less succulent condition, it was plowed under 10 inches deep. After the plowing of the corn cover crop, a

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The State Federal Inspection Service lends a hand and educates growers as to what constitutes a No. 1 potato.

Fertilizer Needs *of* Red Raspberries

By A. E. Stene

Pomologist, Agricultural Experiment Station, Kingston, Rhode Island

A FEW years ago a review of the literature of raspberry growing indicated more or less uncertainty regarding the nutritional requirements of this fruit. Experimental work had been recorded from various sections of the country, and the practices of successful growers had been studied; but conclusions varied considerably and resulted in a general agreement only on one point, namely, that red raspberries require an abundance of humus, and that whenever available, barnyard manure should be applied liberally, especially in preparing the field for planting.

Opinions regarding chemical manures ranged from a general statement that they were of little value, to a suggestion that in some cases, where the need was clearly indicated by the condition of the plants, annual applications of nitrogen might prove profitable. Phosphoric acid and potash, though mentioned, were considered by a majority of writers as of doubtful value. Inquiries from growers regarding the fertilization of other brambles and grapes were nearly as difficult to answer on the basis of available information. This led the Rhode Island Experiment Station, in 1926, to plan experimental work which might throw some light on the questions, at least on Rhode Island soils, and when barnyard manure is not readily available.

It was decided to follow a plan found useful in earlier experiments in ascertaining the relative lime requirements of different crops, which consisted in planting several crops on a level piece of land as uniform as possible in original fertility and giving them identical lime treatments in order to ascertain their relative response to lime additions. It was felt, that a similar knowledge of comparative requirements for the three elements, nitrogen, phosphoric acid, and potash would be helpful even on other soils, or under climatic and site conditions differing from those presented at the Rhode Island Station.

Plan of Experiments

The soil was a sandy loam of average fertility which in growing other crops had indicated no marked deficiency in any of the three principal elements. Red raspberries, black caps, blackberries, and grapes were chosen for the test. Four plats were allotted to each fruit, one plat receiving a 4-10-6 fertilizer, at the rate of 500 pounds per acre, the others, the same amount of two ingredients but none of the third. Each plat contained 1/30 of an acre, and the raspberry plats were planted with 4 rows, 5 feet apart, each of a different variety; viz., Latham, June, Herbert, and Cuthbert. The outside rows in adjoining plats were 7 feet apart.

Fertilizers were broadcast between rows early in the spring, and the soil cultivated until picking time. Old canes were removed, and a cover crop of barley was sown about the second week in August after the last picking. The plants were given a dormant spray with lime and sulphur in the

Fig. 1—Left, no fertilizer; right, complete fertilizer. The difference in height to be noted in this picture gives inadequate indication of the great difference of vigor of plants in the two plats.

spring and a like spray, summer strength, after the fruiting canes of the season were cut out. Earlier experiments at the station had shown red raspberries to be relatively intolerant of acid soil conditions, and lime was therefore applied to the plots so as to establish a soil reaction only slightly on the acid side.

Unfortunately, plants other than red raspberries suffered set-backs from winter-killing, due to the flat site and consequent lack of good air drainage. The results with red raspberries were, however, sufficiently striking, so that fruit yields and cane growth were recorded. There were some very interesting and, in some cases, unexpected differences in hardiness, yield, etc., of the different varieties, but as these variations apparently were not correlated to any significant degree with differences in fertilizer treatment, they will not be further discussed

TABLE I. YIELDS IN KILOGRAMS AND QUARTS AND PERCENTAGE REDUCTION IN YIELDS AS COMPARED WITH COMPLETE FERTILIZER PLAT

Treatment	Year	Total yield per plat, all varieties (4 rows)	Total yield per plat Latham (1 row)	Average yield per plat		Average yield in quarts per acre based on Latham yields	Percentage reduction in yield
				All Varieties	Latham only		
N-P-K	1928	22.7	16.5				
Complete	1929	19.4	10.0	17.0	10.0	2,069	Base
Fertilizer	1930	9.0	3.3				
N-K	1928	17.2	11.7				
No Phosphoric	1929	17.3	10.2	14.1	8.6	1,779	17
Acid	1930	7.8	4.0				
	1928	10.2	6.7				
P-K	1929	16.3	8.7	11.9	6.9	1,447	30
No Nitrogen	1930	9.1	5.3				
	1928	11.6	9.7				
N-P	1929	9.6	6.0	8.0	5.7	1,179	53
No Potash	1930	2.9	1.5				

here except to note that the Latham out-yielded its nearest competitor two to one, or better. This bears out the claim of the Minnesota Experiment Station, where it originated, that this variety, since its introduction, has increased the income of growers of this kind of fruit by a total amount sufficient to pay the cost of the Minnesota fruit-breeding substation from its beginning. Table I summarizes the yield results of this experiment. These results indicate that plats receiving only phosphoric acid and nitrogen gave the poorest yield; complete fertilizer, the best; and the other two gave intermediate yields. Leaving out phosphoric acid and nitrogen decreased the yield 17 and 30 per cent respectively, but leaving out potash reduced the yield 53 per cent.

From an examination of plants in outside rows of one plat, it was apparent that plants were able in some degree to profit from needed fertilizer elements applied to adjoining plats. Yields were therefore calculated for the two inside rows containing the Herbert and June varieties, and the results for all plats are compared in Table II.

It will be noted from this table that the percentage of yield for two varieties, as compared with the yield of all four varieties, ran quite close together except in the case of the no-potash plat, where inside rows yielded proportionally much less than outside rows. The outside row of this plat on one side ran alongside a field getting 1,000 pounds of a complete fertilizer per acre and the opposite, outside row grew next to the plat which received 500 pounds of a complete fertilizer. It would appear from these results that the omission of potash would have reduced the yield even more than indicated in Table I, had the plants been unable to draw plant-food from land adjoining this plat.

Measurements of cane height gave similar indications of nutritive deficiency where one element of the three was left out, but the figures were not quite so striking, possibly because it was impracticable to correlate with height, differences in total number of canes, diameters of canes, and leafiness. In fact, height measurements gave very inadequate indications of the great differences in vigor of plants in the plat receiving a complete fertilizer and in the plat receiving fertil-

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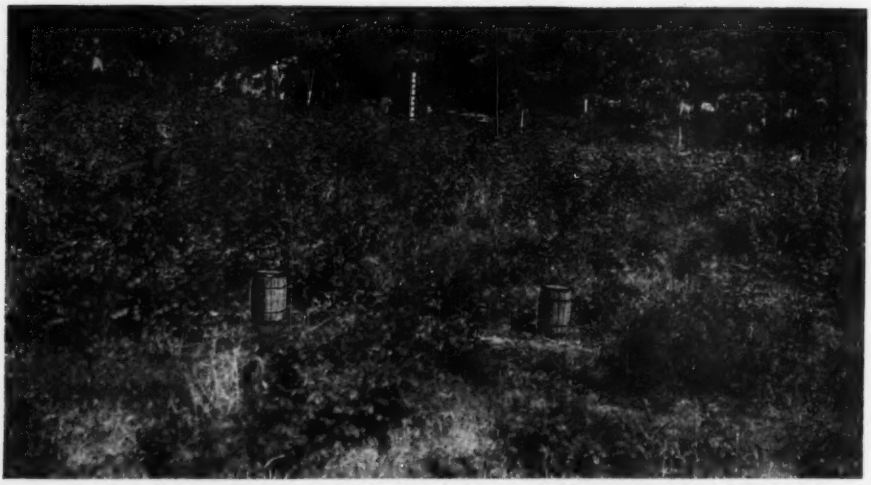

Fig. 2—View of one series of plats in the second experiment. Plat in foreground received no potash. Plat in background received a complete fertilizer. Height indicated by nail kegs in front and a 10-ft. pole in the center rear.

Strawberries— Can Be Profitable

By Clayton A. Bunting
Selbyville, Delaware

THE strawberry industry of the eastern section of the United States is wide, varied, and interesting. It is also in too many instances conducted on a slipshod basis, resulting in little if any profit rather than the handsome $509 net per acre which we realized last year from a rather large test plot of the variety, Dorsett, being grown for market. The firm with which I am associated is primarily engaged in the production of plants, millions of which have been supplied to the market growers of the country in the past few years. This test planting in 1935 was the result of a desire to test both our product and the methods we advocate in the growing of this plant into a money crop.

On the DelMarVa Peninsula where our farms and nursery are located, strawberries as a crop have declined somewhat during the past few years, as a result of the wearing out of strains rather than from the nonexistence of good productive varieties. Such varieties as the United States Department of Agriculture Blakemore will be in the limelight for years; and certainly Big Joe, Lupton Late, Chesapeake, Gandy, Premier, and Missionary are all good varieties if properly grown.

New Varieties Introduced

But it remained for the United States Department of Agriculture to present to the growers of the country Dorsett and Fairfax, without a doubt, the two finest strawberries for any purpose in our generation. Both varieties are very good, and not until last season under the test of market production did the writer finally arrive at a decision as to the better of the two. This conclusion may apply only to our peninsula, for so similar are the two varieties that it is easily possible for one or the other to lead, depending on the section of the country. Both varieties are very productive, and their fruiting season extends over a good three weeks or longer. It is necessary to pick fruit from the plants about 10 times during the season, which just about doubles most varieties in this respect.

Low Acidity Plus Flavor

Prior to the introduction of these two varieties, it was necessary to grow varieties highly acid in their content to assure shipping quality. Of course, this resulted in a sacrifice of flavor in distant markets in favor of shipping quality. The fact that both varieties have low acid content, yet ship well, will no doubt result in an expansion of distant markets to the ultimate benefit of all growers.

There is much to be said for and against various methods of growing strawberries as a market crop. Intensive cultivation of a piece of land prior to its receiving a planting of strawberries is a necessity if you are to realize a weed-free strawberry field the following year. It is impossible to grow a bumper crop of berries amidst a bumper crop of weeds, for not only will they interfere with production of the plants, but with

their ability to ripen the fruit as well. Most any type of well-drained soil can be made almost weed and grass-free over a period of three years of intensive cultivation to any other crop. Thus, for best results, one should plan ahead for this crop. Set your plants in this type of soil. Give them frequent cultivation and use hand and hoe to keep plants free from all other vegetation.

A typical scene in Delaware during strawberry-picking time.

Potash a Necessity

Now comes the vital point of plant feeding. During the war years, due to scarcity of potash, this element became a forgotten product for the growing of farm crops; in fact, many growers of strawberries located in poultry-raising sections have gone so far as to use exclusively the almost free chicken-manure that can be obtained for the hauling. This manure contains, of course, lots of nitrogen in ammonia form, but is relatively low in potash, a vital necessity to successful strawberry culture.

An application of potash at the rate of 10 lbs. to every 100 yards of row should be made in September. Apply this along the side of the row, being careful not to let any hit the plants, particularly if they are damp. It should be cultivated in immediately. Applied at this season, potash has plenty of time to get into action and will result in a heavier root system and stronger fruiting buds.

Another fault to be found is in the method of spring fertilization which is generally applied along in April, too late to realize the return that would be possible if it was applied earlier and was of the right content.

The proper procedure of the so-called top-dressing of strawberry plants is to apply a fertilizer analyzing 4 per cent ammonia, 8 per cent phosphoric acid, and 10 per cent potash. Instead of being broadcast in the strawberry rows in April, this application should be made not later than the early part of March, and preferably in January or February, in order to give the potash ample time to act. Potash disseminates slowly and here on the Peninsula and in most of the sections of the East and Central West, when applied in April it has little value to a crop which ripens in May and early June.

With the more balanced plant-food containing the much needed potash, one will get instead of a rank, heavy

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Mangels Respond To High Potash

By Maynard S. Grunder

Agronomist, Western Washington Experiment Station, Puyallup, Washington

THERE are, without question, many instances where the failure of the commonly recommended rates of application of the various fertilizer elements to show appreciable results, is due to the tying-up of the element in the soil in a form not available to plants, rather than to a lack of need for that element. Much more information on this subject is needed. The data following are presented not as conclusive evidence nor even as a recommendation for high applications, but to suggest that an experimental procedure involving higher applications than those commonly used may be productive of some valuable and interesting results.

There is, in my opinion, considerable danger in using single rates of application of the several fertilizer elements as a basis for definite recommendations, especially when those rates are relatively small. This would be especially true where the use or non-use of the element studied is to be based on the result obtained. Such a test may be decidedly unfair to the element studied and, still more important, it may delay adequate study of the element where small applications fail to give results.

It is evident that the rate of fertilizers commonly recommended for and applied to various crops may not always be that which will give the highest yields or the largest net return per acre of crop yields. It seems reasonable to suppose that in many cases, much greater return might be secured from larger applications of certain fertilizer elements than those ordinarily applied, especially in cases where the crop grown is a heavy feeder of the element in question. Even in cases where there is apparently a sufficient supply for the needs of the crop, the element may not be available in sufficient amount for rapid growth.

With this in mind an experiment was started to determine the response of mangels to varying quantities of potash (when an abundant supply of nitrogen and phosphorus were applied). The plots used in this experiment were 1/10 acre in size. Plots receiving no potash were located at intervals in the series to serve as checks. All plots (checks and potash) received the same applications of nitrogen and phosphorus.

A 3-Year Experiment

Potash was used as the variable factor in the present studies, although similar studies involving the use of phosphorus and nitrogen, as well as the rarer elements, are of equal importance. Potash was selected because extensive field plots over western Washington, using small, single rates of applications of potash on various crops, either failed in many cases to give favorable responses or actually appeared to depress the yield of various crops.

The potash applications (muriate of potash) varied from 300 to 1,000 pounds per acre. The potash and phosphorus were broadcast on rough plowed ground several weeks in advance of seeding the plots, while the

nitrogen (nitrate of soda) was applied immediately previous to seeding the mangel crop.

The experiment was continued with this set-up for three years. The data obtained were in some cases quite variable, and the average yields varied widely in different years. However, during the three years there were few instances when the potash-fertilized plots failed to produce a substantial increase in yield over the check plot. In some cases remarkable increases in yield were secured by the use of potash. In one case the yield over the nitrogen-phosphorus fertilized check plot was increased 76 per cent, or more than 20 tons per acre by the use of 600 pounds of potash per acre.

High Yield and Economy

During the first year of the experiment, the results were favorable to higher applications of potash, from the standpoint of yield, although the trend toward higher yields did not correlate closely with the increasing applications of potash. For example, the 300 and 400-pound applications increased the yield between 2 and 3 per cent, while the 500-pound application jumped the yield 22 per cent. The 600 and 800-pound applications increased the yield by 9 per cent, while the 700-pound application resulted in an 18 per cent increase. The 900 and 1,000-pound applications were very similar with 28 and 26 per cent increases respectively.

Considered from the standpoint of economical production, the lowest costs per ton the first year (including the cost of the fertilizer and other production costs) were secured on the plots receiving 500, 900, and 1,000 pounds in the order given.

The average of all potash-fertilized plots was 30.87 tons as compared to 26.85 tons for those not receiving potash, an average increase of 4.02 tons or approximately 15 per cent.

The second year of these experimental plots showed remarkable results of the effect of higher concentrations of potash. The 300 and 400-pound applications showed comparatively small increases. The 500-pound application resulted in an increase of almost 30 per cent, while the 600-pound application made the remarkable increase of 76 per cent over the check plots receiving no potash. The 700, 800, and 900-pound applications showed successively less effect than the 600-pound application in increasing the yield, while the 1,000-pound application, strangely enough, again showed a considerable increase.

No Depressive Effect

These results are remarkable in that the increasing concentrations of potash gave increasing yields up to a certain point, after which a decreasing effect was secured. (It is significant, however, that in no case was there a depressive effect observed on the mangel crop as a result of the application of high concentrations of potash when compared with the check plot.)

Largest yields as well as lowest cost of production per ton (including fertilizer cost) were obtained from 600, 700, and 800-pound applications in the order given. The average yield of all potash-fertilized plots was 36.34 tons per acre as compared to 27.24 tons for the check plots, an increase of 9.1 tons per acre or more than 33 per cent.

During the third year of these experiments, yields were very low, due to an unfavorable season and to the fact that the soil on which the crop was planted was somewhat more sandy than that used in previous years. With one exception, large increases were secured from all potash applications. This exception was the 600-pound application which for some reason showed no effect this year. The high peak so evident last year did not show up this year.

Because of the low yields the cost per ton of producing the crop was

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We Did "Sumpin" About It

By F. H. Jeter
North Carolina State College of Agriculture

ROBERT said we had to do "sumpin" about it and Robert knows, because he has been on the farm for 15 years. I inherited him along with the land back in the early part of 1932 when my father's cotton plantation was divided into 12 parts. My share was 216 acres of a tract known as the Lyles Place. It was set apart for me because, as a young chap, I had often wished that the particular farm were mine, but in those days the tract contained 700 acres and was too valuable for my slender earnings.

When an older brother, who is one of the administrators of the estate, wrote me that I had been given a part of the farm that I had so desired, I immediately set out from Raleigh to drive the 240 miles to see my new possession. The brother had mentioned that Robert was on the farm and that I would probably have to fix up his house a little, buy a few implements, and perhaps a mule. He also said I would have to "advance" Robert for making the crop, but that he, the brother, would help me in my long-distance farming.

A Forlorn-looking Place

The farm that I knew as a kid was no longer there. In my rather infrequent visits to the home place, I had not inspected this particular farm with any critical eye, and I was unprepared for the waste of eroded land, the red clay showing above the warm sandy loam, the gullies which ravaged the principal field, and the tumbled, forlorn buildings. So busy in my own job in North Carolina, I had forgotten that the cotton farmers of South Carolina also had suffered through the years of low prices and were lucky to hold their farms together, to say nothing of keeping them in a state of improvement.

Mr. Jeter standing in field of corn which yielded well after "we did sumpin about it."

Robert had been farming with two, old, worn-out plug mules and a little fertilizer. He had planted each year about 30 acres of cotton and had harvested from these acres such as the land would yield with indifferent cultivation. But he met me with a smile, and we drew up a contract. We shook hands, and I told him I would stick to him as long as he stuck to me and

did the things I told him to do as well as he could. That's the only contract we ever had. We went over every foot of the land and decided where we would plant cotton, where corn, and what we would need in the way of implements and other equipment.

Robert Goes to Work

Robert went to work fixing up the terraces, stopping gullies, repairing the houses, and hauling woods-mold both to the barn and to the "galded" spots in the fields. I bought some ground limestone and got him to bed his cotton land on this and to put some under the corn. We decided to use a 3-9-3 fertilizer and to top-dress both the cotton and the corn with nitrate of soda. Then, we secured a bushel of Mexican Big Boll seed from Paul Kime of the North Carolina Experiment Station. We got a bushel of Latham's Double corn from the originator, bought some soybeans from eastern North Carolina, and started to work.

I suspect the limestone helped to pull still more of the feeble remnant of soil fertility out of the land, because at any rate, we had a good season and our crop looked good. Our one-acre seed patch of "fine cotton" grew splendidly, and apparently we would make enough money to pay our bills. We did pay out in spite of cotton at five cents a pound.

The next season, 1933, we did better because we had plowed under a cover crop of vetch, had started lespedeza on the small grain, had rotated our crops, bought some pure-bred Rhode Island Red chickens, built a new fireplace and chimney in Robert's house, and had purchased a new fertilizer distributor and planter. I think our profit after all the bills and taxes were paid amounted to $16. No great amount, but a sign of progress.

Increased Fertilizer

In 1934, we signed a contract and reduced our cotton acreage 35 per cent. That meant that Robert would have to do a little more intensive farming. We changed our fertilizer formula to a 4-8-4 and continued to top-dress with nitrate of soda. But Robert was beginning to get interested, and so one day he took me over to a part of a field where he made the statement with which I opened this article. He repeated that we had to do "sumpin" about that spot. The cotton turned red and lost its leaves, and even corn was streaked and didn't do so well.

So we got a sack of 20 per cent

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Robert standing in a field of cotton which later had to be topped because "sumpin" had been done about it.

Humus, Fertilizers, *and* Plant Nutrition

By R. E. Stephenson
Oregon State Agricultural College, Corvallis, Oregon

SCIENTISTS have emphasized at different periods the humus and the mineral theories of soil fertility. Enthusiasts for both concepts have doubtless gone to the extreme in propounding arguments and seeking proof for their own point of view. Their various arguments have been considerably analyzed, and perhaps we are now ready for a rationalized interpretation of those somewhat elusive soil properties that constitute fertility.

Humus has special functions in plant nutrition, and these perhaps deserve all the emphasis one is capable of giving. Humus is not itself a direct plant nutrient, but it is the seat of many and sometimes only too slightly familiar biological and chemical processes. These processes are essential to the growth of plants.

Humus Makes Soil

Common-place is the function of humus in supplying nitrogen; in furnishing solvents, such as nitric, sulfuric, and carbonic acids; and in maintaining a granular, permeable, mellow soil structure. Humus is that component which ultimately makes soil out of mineral matter.

Everyone now believes in a class of substances essential in animal nutrition, which for lack of sufficient identification are called vitamins (meaning essential to life). Many believe that plants require for their growth substances similar in function but differing in identity from the vitamins of animal nutrition. These substances by one worker (Bottomly) were designated "auximones" or growth promoters. The "bioses" necessary for the growth of yeasts are similar substances.

Plant Vitamins

The first question we should like a definite answer for is, whether such substances really are essential to plant growth as they are in animal nutrition; and if so, the second question is the source of the "auximone." Must one lay aside the concept of a certain number of elements that are essential to plants, and with these provided, there is nothing more that can be done in the way of soil fertilization?

The first question can be answered partially with the ever-increasing evidence that plants do need something in the nature of vitamins for normal growth. The latest bit of evidence is a fine piece of work (Williams, in Oregon) in isolating from many sources a substance that functions perhaps as a universal growth promoter for plants. This substance, designated pantothenic acid (from everywhere), has shown profound effect upon the carbohydrate metabolism of alfalfa. Even uninoculated alfalfa plants, treated with the minutest quantities of the pantothenic acid, made more growth than the inoculated alfalfa with the "nutrilite" omitted. Dr. Williams suggests the name "nutrilite" to distinguish the plant-growth promoters from the vitamins, or animal growth promoters. The name implies only that the substance, pantothenic acid or what not, functions

in some way that is important to the nutrition of plants. The "auximones" of previous studies, and the "bioses" of yeast nutrition belong to this class of entities.

Sources of "Nutrilite"

An important source of the "nutrilite" appears to be the organic matter of the soil. The pantothenic acid or other "nutrilite" is generated by soil bacteria and fungi which break down organic matter. Aspergillus niger, very abundant in soils, is especially capable of synthesizing the "nutrilite." Williams believes that higher plants are not able to synthesize the "vitamin-like" substances so important to their own growth, but that they are dependent entirely upon the soil micro-organisms in this respect, just as the animal is dependent upon the plant for synthesis of the vitamins needed for animal growth.

These interpretations based upon a limited number of established experimental facts give new importance to the function of humus in plant nutrition. Bottomly's "auximone" concept was similar to this. He believed that bacteria in the soil generated the "auximone" by breaking down organic matter. Bottomly somewhat wrecked his whole contribution by commercializing what he considered a great discovery. His bacterialized peat, sold under the trade name "humogen," failed to do what was claimed for it. A little sphanium peat inoculated with azotobacter perhaps could hardly make much of a showing on soils already containing humus and micro-organisms capable of synthesizing the "auximone" that he believed so important to good crop yields.

Need More Study

This new and rather elusive field of research has received only too little study up to the present time. Definite proof of what appears a reasonable conclusion is hard to obtain. The exact identification of "nutrilites" as to chemical composition and formula has so far eluded all workers. The extremely small quantities of such substances, which act catalytically as growth promoters, make them difficult to isolate, and their functions hard to follow. The future has much to reveal as to their identity and properties.

Some workers stress the importance of humus as a carrier of the rarer, less abundant, but none the less important minerals of the soil. Humus has the property of combining with and holding in soluble form, such metals as copper, iron, nickel, cobalt, manganese, zinc, aluminum, chromium, and titanium, many of which in small amounts may have important functions in the nutrition of plants. McHargue postulates that the plant absorbs these rarer elements that are important growth stimulants, and synthesizes them into the "vitamins" so necessary to animal nutrition. He thinks the same rarer elements in organic combinations serve as growth stimulants in both the plants and animals. As evidence of his claims, he cites the relatively high manganese and copper content of those parts of the plant and those organs of the animal that are especially prized for their vitamin potency.

Significance of Humus

The particular significance of humus, as related to these rarer minerals, is in the capacity of humus acids to combine with the metals and hold them in forms that are acceptable to plants. Burk found that a humus-iron combination could be used in culture solutions as a source of iron more satisfactorily than any mineral form of iron. The humus-iron is not precipitated by the phosphates of the culture solution as the mineral form of iron is precipitated. A small quantity of humus-iron added once or twice during the growth period of culture plants, proved more effective than mineral forms of iron added in small amounts every other day. The significance of the minor elements in

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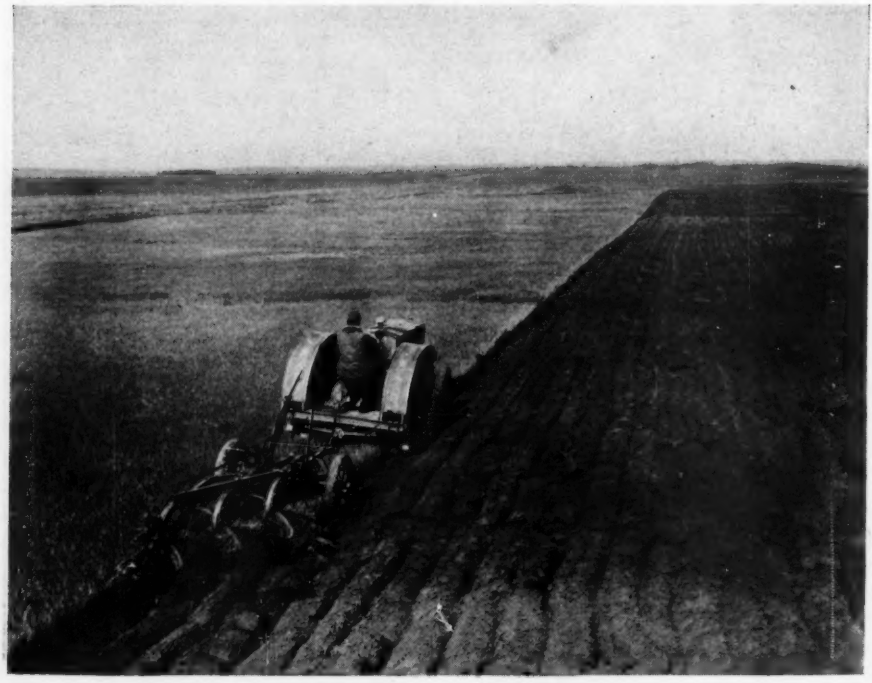
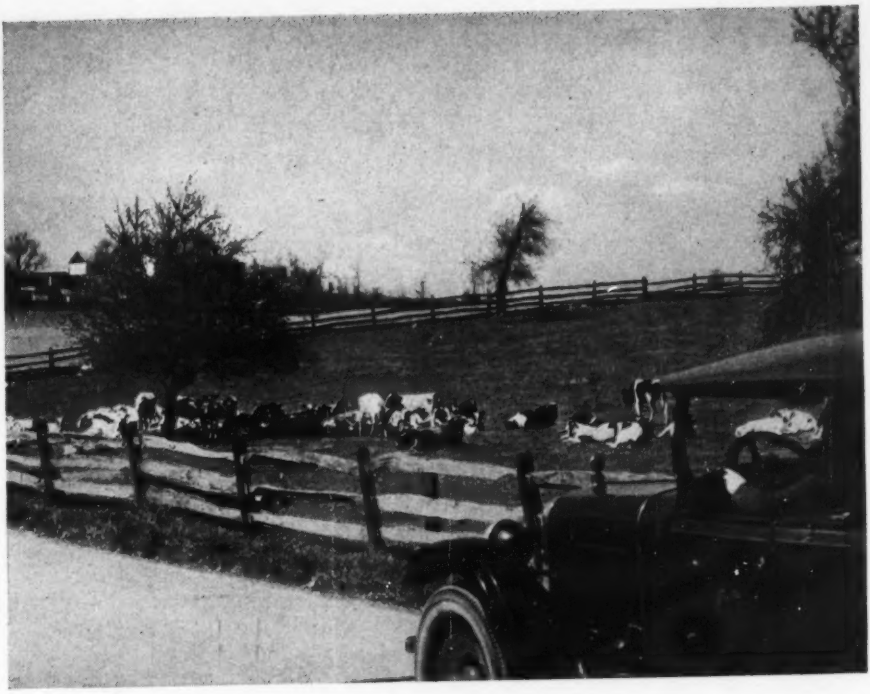
PICTORIAL

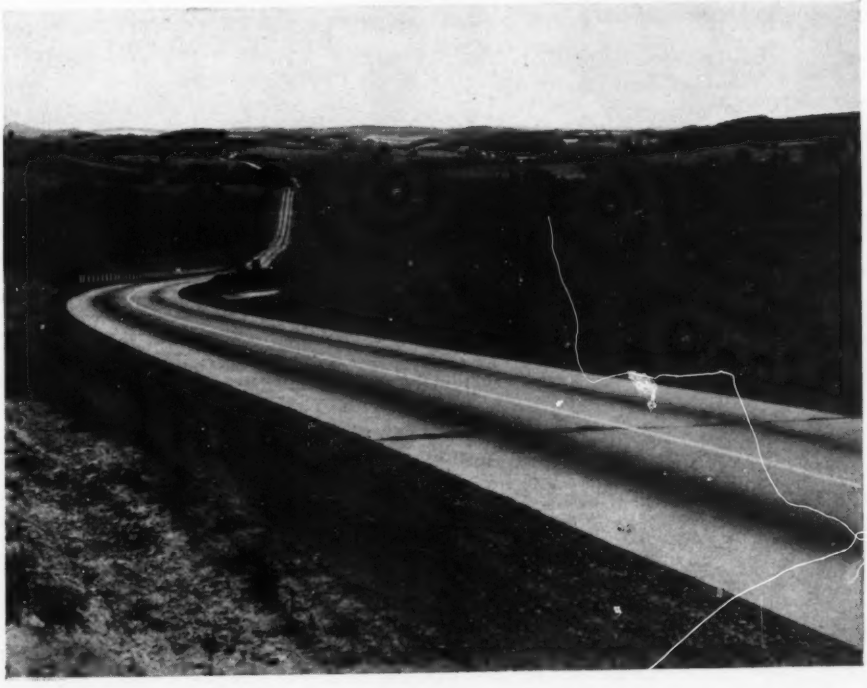
TROUBLE AFOOT.

The Call of the Open Fields





The Call of the Open Roads



School busses save rural children many miles of weary trudging and give them more time and energy to enjoy farm pets and wholesome work and play.

The Editors Talk

S. D. Conner

Agricultural scientists were grieved as word of the sudden death of one of their prominent members, Professor Samuel D. Conner, of Purdue University, on April 20, became known. His death was a severe shock to his family and friends as he had been ill only since the afternoon of April 17, when he left his laboratory because of illness.

The passing of Professor Conner marked the end of a career devoted to the general welfare of agriculture, a career which had brought scores of contributions that have meant much to the progress of farming. He was known the world over in the field of science because of his soil fertility studies which began in 1899 when he joined the staff at Purdue as deputy state chemist, a post he held for eight years. He then was assistant professor of agricultural chemistry for six years, but since 1913 he had been soils and crops chemist on the Experiment Station staff and for some years had been in charge of the research chemical laboratory of the station. His studies of soil acidity, its causes, and methods of testing for acidity had become standard in the entire field of scientific agriculture. Professor Conner was perhaps the principal figure in developing the muck lands of northern Indiana, as his discoveries in the use of potash on those soils pointed the way toward their profitable management. He was author of more than 100 articles and bulletins reporting on different phases of his work at Purdue, the institution from which he was graduated in 1894.

For many years Professor Conner had either tested personally or in cooperation with his colleagues, from 2,000 to 3,000 soil samples sent to Purdue each year by Indiana farmers so that he could advise them on limestone or fertilizer needs. He also helped develop simple methods of testing soils and was associated with other Purdue men in putting out a soil and plant tissue test put up in a convenient kit for field and laboratory use, which last year resulted in from 35,000 to 40,000 samples of soil being tested over the state and hundreds of thousands of tests in other states.

Besides several fraternal organizations, Professor Conner held membership in many learned societies, including the Indiana Academy of Science, Sigma XI, American Chemical Society, American Society of Agronomy, American Soil Survey Association, American Association for the Advancement of Science, and the International Society of Soil Science.

The early passing of men of such calibre—Professor Conner was only 63 years of age—is a distinct loss to the advancement of agriculture. Their contributions are and will continue to be appreciated highly, but to be deprived of their further work and the confidence to be placed in their years of experience and sound judgment is a misfortune which will be widely felt.

A Million in 4-H Clubs

A recent news release of the U. S. Department of Agriculture quotes Dr. C. W. Warburton, Director of Extension Work for the Department, as saying that there are now nearly one million boys and girls enrolled in 4-H clubs as shown by the tentative figures recently compiled for 1935. The agents reported an enrollment of 997,457 club members in the United States, Hawaii, Puerto Rico, and Alaska. This is 81,395 more members than in 1934 or about a 9 per cent increase. The largest increases in enrollment are in the southern states which supplied more than half of the total increase.

These young people are studying improved methods of farming and homemaking and are learning cooperation and good citizenship under the direction of extension agents cooperatively employed by the U. S. Department of Agriculture and the state agricultural colleges. National figures were compiled from the reports of county agents who organized and carried on the clubs with the help of 106,215 local volunteer club leaders. Club work is carried on in 2,960 counties.

In addition to the 4-H clubs, nearly 45,000 other rural young people have organized groups to study with extension agents their problems on the farm and in the home. This group shows an increase in membership of 7,728 young farmers and homemakers over the 1934 figures.

These figures are significant, especially when tied up with some remarks recently made by Dr. O. E. Baker, Senior Agricultural Economist of the Department, in an address "Why I Want My Boy to Be a Farmer," delivered at the University of Wisconsin. Dr. Baker pointed out that on the farm, population is increasing rapidly. Already more than 2,000,000 youth are backed up on farms, who would under predepression conditions have migrated to the cities. These young people are marrying and starting homes. More than 500,000 new farms have been started since 1930, according to the census.

Dr. Baker believes that although the problems of land utilization and maintenance of the standard of living on farms seem likely to become more acute with the passage of time, these will prove less difficult to solve than the problems that are facing the cities. The farmer accumulates more property—becomes a wealthier man than the average city person.

The farmer is more likely to rear a family and do his part to promote the welfare of the Nation and the race. The family is becoming smaller and weaker in the cities. Only two-thirds enough children are now being born in our large cities to maintain their population permanently. Dr. Baker comes to the conclusion that in considering the problems of conserving the soil resources of the United States, the problems of land utilization, and more recently, the problems of agricultural prosperity and of national welfare, there is no substitute for the institution of the family. It is becoming clear, he says, that the land is the foundation of the family, and that the family is the foundation of the state.

The increasing interest of farm families in solving farm problems, as shown by the increase in 4-H membership, bolsters faith in the advancement of our agriculture. Land utilization is of vital importance and with a younger generation, both out of necessity and natural liking, learning improved methods and striving to excel in profitable management, we are well along on the right road.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

Reporting results of five years' investigations on "Cabbage Fertilization in Southwest Virginia," Bulletin 88 of the Virginia Truck Experiment Station contains many significant details relating to cabbage production in this important area. According to the author, M. M. Parker, the commercial crop is principally confined to two typical mountain counties in the southwestern section of the state, comprising the mountain and fertile valley soils. The bulletin states that 2,600 acres as an average for the past two years are devoted to this crop annually. During this same period the average yield is recorded to be 5.5 tons to the acre. Much of the land employed in cabbage production had been in native bluegrass pasture, which had caused a scarcity of one or more of the important plant nutrients. The lack of these nutrients has frequently been indicated by the failure of the cabbage crop to produce maximum yields.

The investigations emphasized the importance of applying ample amounts of phosphoric acid in the fertilizer mixture. Supplying sufficient phosphorus increases the amount of nitrogen and potash that can be advantageously utilized by the plant. It was determined that a 4-8-12 analysis when applied at the rate of 1,000 pounds per acre before planting gave best results, and is recommended for soils of average fertility. The more fertile soils which have received stable manure or a leguminous crop turned under respond satisfactorily to an 0-8-12 or 2-8-12 at 1,000 pounds per acre before planting, supplemented with nitrate of soda, or an equivalent amount of quickly available nitrogen, when the plants begin to head. Although the soils used for cabbage production in this section are apparently well supplied with potash, results showed that relatively large amounts (120 pounds K_2O per acre) gave substantial increases in yield, as obtained by the use of a 4-8-12 mixture applied at the rate of 1,000 pounds per acre.

The suitable varieties of cabbage described in the bulletin are Copenhagen Market for the early crop, Wisconsin All Seasons for the medium, and Wisconsin No. 8 or Penn State Ballhead for the late crop. Mentioned as the most common rotation practiced is corn, cabbage, wheat, and grass or clover. Many impressive illustrations depicting the crop response to the various treatments are contained in the bulletin.

"A Study of Some Trace Elements in Fertilizer Materials," Agr. Exp. Sta., Gainesville, Fla., Tech. Bul. 290, Feb. 1936, L. W. Gaddum and L. H. Rogers.

"The Use of Zinc Sulphate Under Corn and Other Field Crops," Agr. Exp. Sta., Gainesville, Fla., Bul. 292, Mar. 1936, R. M. Barnette, J. P. Camp, J. D. Warner, and O. E. Gall.

"Maryland Fertilizer Facts for 1935," Inspection and Regulatory Service, College Park, Md., Mar. 1936, L. E. Bopst, Associate State Chemist.

"Inspection of Commercial Fertilizers," Agr. Exp. Sta., Amherst, Mass., Control Series, Bul. 81, Dec. 1935, H. D. Haskins.

"Fertilizer Experiments in the Morganthau Orchard: Six Years' Results with Nineteen

Treatments," Agr. Exp. Sta., Geneva, N. Y., Bul. 661, Jan. 1936, R. C. Collison and L. C. Anderson.

"Spring and Fall Fertilizer Sales in Ohio—1935," Dept. of Agronomy, Ohio State University, Columbus, Ohio.

"Inspection of Fertilizers," Agr. Exp. Sta., Kingston, R. I., Ann. Fert. Cir., Sept. 1935, W. L. Adams and A. S. Knowles, Jr.

"Results of Fertilizer Grade Survey by Counties in Rhode Island, 1935," Dept. of Agr. and Conservation, Bureau of Markets, Providence, R. I., Russell C. Hawes, Chief.

Soils

"Our Heritage—the Soil," is the appropriate title of Bulletin 175, Agricultural Extension Service of Ohio State University, by R. M. Salter, R. D. Lewis, and J. A. Slipher. Interesting discussions on what is happening to the soils of Ohio farms, factors involved in soil deterioration and improvement, using the soil productivity balance in evaluating and adjusting farming systems, and many other related topics are the subjects contained in the publication. From the introduction the following is quoted: "We are told that, in the United States, farm lands equal to five times the cropped area of Ohio already are ruined beyond hope of redemption, and that a vastly larger area is rapidly approaching this unhappy state. Truly, this is a dismal picture, and, if true, a damaging indictment of the system that has permitted the exploitation of the nation's most valuable material heritage, the soil."

That evidence of soil deterioration in Ohio may not be alarming if crop yields are indicative of this condition is suggested by the fact that all yields are equal to or slightly above what they were 60 years ago. However, this interpretation does not reveal that the many improved farming methods introduced and partially adopted within the past half century, including tilling, improved varieties, more lime and fertilizers, etc., should have increased the acre yields 40 to 60 per cent. Furthermore, it must be considered that thousands of worn-out areas in eastern Ohio have been discarded for more productive land, which is another factor which maintains the yield level in Ohio. The inherent potential capacity of the land has been deteriorating almost fast enough to offset all the improvements made in soil and crop management.

The cropping system is termed to be the dominant factor in soil deterioration and its opposite, soil improvement. Liming the acid soils for legume crops, the use of manure and fertilizers, and special management practices for controlling soil erosion are very important soil-improvement processes. Adjustments of the conservation balance are reached by a reduction of rotated area planted to intertilled crops such as corn, an increase in the proportion of rotated area in sod crops, and by increasing the use of biennial and perennial legume sod crops, as clover, alfalfa, and mixtures containing alfalfa. Some of the present farm land should be removed from agricultural use. Much of the rotated area might well be transferred to permanent pasture, the bulletin concludes.

"Soil Blowing and Its Control in Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 419, Jan. 1936, J. F. Brandon and Alvin Kezer.

"Twenty Years of Soil Fertility Investigations," Agr. Exp. Sta., Manhattan, Kans., Tech. Bul. 40, Oct. 1935, R. I. Throckmorton and F. L. Duley.

"Inspection of Agricultural Lime Products," Agr. Exp. Sta., Amherst, Mass., Control Series, Bul. 82, Dec. 1935, H. D. Haskins.

"The Composition and Constitution of the Colloids of Certain of the Great Groups of Soils," U. S. D. A., Washington, D. C., Tech. Bul. 484, Dec. 1935, Horace G. Byers, Lyle T. Alexander, and R. S. Holmes.

"Soil Survey of Franklin County, Massachusetts," U. S. D. A., Washington, D. C., Series 1929, No. 9, W. J. Latimer, L. R. Smith, and Carey Howlett.

"Soil Survey of Valley County, Nebraska," U. S. D. A., Washington, D. C., Series 1932, No. 4, R. L. Gemmell, E. A. Nieschmidt, R. H. Lovald, F. A. Hayes, and S. Rankin Bacon.

Crops

Circular No. 15, Louisiana State University and Agricultural and Mechanical College, entitled "Pasture

Production and Management," by R. H. Lush, offers many practical suggestions on how to "help the land to grow more nutritious grass." The success of permanent pastures depends on types of land used, method of soil preparation, liming and fertilization, and proper care of the sod after it becomes established. The most economical pastures are found to exist on the best land, judging from the experiences of dairymen. Proper drainage is essential on alluvial land, and terraces are necessary on hill land. The more sandy types of soil cannot be easily made to grow productive pastures, the author states. It is generally advised to apply a ton of finely ground limestone per acre for each pH below 6.0. From 200 to 400 pounds per acre of a 4-12-4, or less amounts for higher analysis fertilizers, worked in before seeding will prove a good investment on poorer hill or prairie land, while good soil or first bottom land does not need commercial fertilizers. Grazing tests on old pastures in 1935 which had been top-dressed four years with 400 pounds per acre of 4-10-5 resulted in 82 per cent more milk than was obtained from grazing the unfertilized pasture. Suggested as the logical time to top-dress with a complete fertilizer is late winter just before dragging to spread manure. Pasture mixtures and the rate of seeding are listed with respect to their adaptations for different soil classifications of the state. Temporary pastures, management of livestock on pasture, and other subjects are also discussed in the circular.

"Sugar-Beet Production in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 95, Jan. 1936, W. W. Robbins and Charles Price.

"Forty-Eighth Annual Report, For the Fiscal Year 1934-35," Agr. Exp. Sta., Fort Collins, Colo., E. P. Sandsten, Director.

"Lawns, Planting and Maintenance in Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 420, Feb. 1936, George Beach.

"Report of the Director For the Year Ending October 31, 1935," Agr. Exp. Sta., New Haven, Conn., Bul. 381, Feb. 1936, William L. Slate, Director.

"Pasture Investigations, Sixth Report, Seasonal Variations in the Reaction, Nitrates and Ammonia of Soil from Differently Fertilized Permanent Pastures," Agr. Exp. Sta., Storrs, Conn., Bul. 206, Sept. 1935, Henry Dorsey and B. A. Brown.

"Tomatoes," Ga. Exp. Sta., Experiment, Ga., Cir. 106, Jan. 1936, J. E. Bailey.

"Report on Agricultural Research For the Year Ending June 30, 1935," Agr. Exp. Sta., Ames, Iowa, R. E. Buchanan, Director.

"Tree Fruits for Iowa," Agr. Exp. Sta., Ames, Iowa, Bul. 341, Dec. 1935, H. L. Lantz.

"The 1935 Iowa Corn Yield Test," Agr. Exp. Sta., Ames, Iowa, Bul. 343, Feb. 1936, Joe L. Robinson and M. M. Rhoades.

"Management of Kansas Permanent Pastures," Agr. Exp. Sta., Manhattan, Kans., Bul. 272, Sept. 1935, A. E. Aldous.

"Seed Inspection," Agr. Exp. Sta., Amherst, Mass., Control Series, Bul. 80, Nov. 1935, F. A. McLaughlin.

"Dahlias, Their History, Classification, Culture, Insects, and Diseases," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 266, Dec. 1935, C. E. Wildon.

"Garden Flowers," Agr. Ext. Div., Mich. State Col., East Lansing, Mich., Ext. Bul. 155, Feb. 1936, C. E. Wildon.

"Forty-Sixth Annual Report," Agr. Exp. Sta., State College, N. M., Fabian Garcia, Director.

"Varieties of Vegetables for 1936," Cornell Univ., Agr. Ext. Serv., Ithaca, N. Y., Bul. 343, Mar. 1936, Paul Work.

"Fruits and Nuts for Home Use," Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 210, Mar. 1936, H. R. Niswonger and E. B. Morrow.

"The Use of Artificial Light and Reduction of the Daylight Period for Flowering Plants in the Greenhouse," Agr. Exp. Sta., Wooster, Ohio, Bul. 559, Nov. 1935, G. H. Poesch and Alex Laurie.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXI, No. 179, March-April 1936.

"The Root-Weevils Injurious to Strawberries in Oregon," Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 330, June 1934, J. Wilcox, Don C. Mote, and Leroy Childs.

"Lawns," Agr. Exp. Sta., State College, Pa., Ext. Cir. 160, Jan. 1936, Fred V. Grau.

"Gladiolus Culture with Special Reference to Winter Forcing," Agr. Exp. Sta., Kingston, R. I., Bul. 255, Dec. 1935, Basil E. Gilbert and Frederick R. Pember.

"Renovating Bluegrass Pastures," Agr. Ext. Serv., Madison, Wis., Cir. 277, Jan. 1936, L. F. Graber.

"The Carbohydrate-Nitrogen Relation in Symbiotic Nitrogen Fixation," Agr. Exp. Sta., Madison, Wis., Res. Bul. 129, Oct. 1935, P. W. Wilson.

"Forty-Fifth Annual Report, 1934-35," *Agr. Exp. Sta., Laramie, Wyo., J. A. Hill, Director.*

Economics

The Aroostook County Council in its recent publication, "Long-time Agricultural Program for Aroostook County," has given us an interesting picture of the many economic problems confronting the potato farmers of that section of Maine. Aroostook produced 15.3 per cent of the total 1934 United States potato crop. Soil and climatic conditions have been favorable to the production of good potatoes and have been responsible for the popularity of the crop. At the same time, these natural conditions have limited the production of other cash crops. The prosperity of the county fluctuates with the prosperity of this one crop, potatoes.

Due to the extremely low prices that have prevailed during the past few years, Aroostook has piled up large financial losses. It is concluded that unless something is done to meet this situation, the county will eventually face financial ruin.

In order to solve the problem it is proposed that the potato growers reduce production costs by following very closely the recommendations of their experiment stations; that a study of the marketing costs be made in an effort to turn a higher percentage of the consumer's dollar to the producer; that the quality be improved by more careful handling at digging time, by better grading and more efficient storage and shipping.

It was found that in October of 1935, the producer was receiving 33.03 per cent and the transportation companies 46.51 per cent of the consumer's dollar. The other 20.46 per cent went for sacks, loading costs, brokerage, and miscellaneous costs.

The first problem, that of production costs and better farm organization, is up to the individual, and the marketing problem can only be solved by cooperative action on the part of all concerned.

The Agricultural Extension Staff of the North Carolina State College has published an interesting and comprehensive program for improving North Carolina agriculture in Extension Circular No. 208, "Agricultural Program for North Carolina." This is a revision of the Program adopted in 1929. It is pointed out that "for a long time North Carolina has grown too many acres of cash crops and not enough feed and soil improvement crops." This system has been gradually changing for the better. The depression accelerated the change, especially with respect to feed crops.

The change should not be radical in nature and the general types of farming now in vogue should be continued with adjustments in acreage to provide for better crop rotations, more feed crops and greater numbers of livestock, fewer acres of row crops and a careful system of soil management. The state is divided into areas and a suggested farm management program is given for each area and each soil type.

"Type of Farming Areas in Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 418, *Sept.* 1935, *Byron Hunter, L. A. Moorhouse, R. T. Burdick, and H. B. Pingrey.*

"Illinois Farm Economics," Agr. Exp. Sta., Urbana, Ill., No. 10, *Mar.* 1936.

"Part-Time and Garden Farming in Iowa," Agr. Exp. Sta., Ames, Iowa, Bul. 340, *Dec.* 1935, *Ray E. Wakeley.*

"Seasonal and Short-Time Fluctuations in Wheat Prices in Relation to the Wheat-Price Cycle," Agr. Exp. Sta., Manhattan, Kans., Tech. Bul. 39, *Sept.* 1935, *R. M. Green.*

"Readjusting Montana's Agriculture," Agr. Exp. Sta., Bozeman, Mont., II. "Montana Farm Prices," Bul. 308, *Jan.* 1936, *P. L. Slagsvold; III. "Population Resources and Prospects," Bul.* 309, *Jan.* 1936, *Roland R. Renne and Carl F. Kraenzel; IV. "Land Ownership and Tenure," Bul.* 310, *Feb.* 1936, *Roland R. Renne; V. "Economic Changes in Montana's Range Livestock Production," Bul.* 311, *Feb.* 1936, *M. H. Saunderson.*

"Farm Economics," N. Y. State Col. of Agr., Ithaca, N. Y., No. 94, *Mar.* 1936.

"Home-Grown Roughage and Milk Production Costs," Agr. Exp. Sta., Kingston, R. I., Bul. 254, Dec. 1935, J. L. Tennant.

"Milk-Production Costs in West Virginia, I. A Study of the Costs Incurred by 51 Farms in the Morgantown and Fairmont Markets in 1934-35," Agr. Exp. Sta., Morgantown, W. Va., Bul. 268, Feb. 1936, L. F. Herrmann, R. O. Stelzer, and G. A. Bowling.

"Forces Affecting Wisconsin Agriculture with Resulting Types of Farming," Agr. Exp. Sta., Madison, Wis., Res. Bul. 131, Nov. 1935, P. E. McNall and W. J. Roth.

"Car-Lot Shipments of Fruits and Vegetables from Stations in the United States for the Calendar Years 1932 and 1933," U. S. D. A., Washington, D. C., Stat. Bul. 50, Jan. 1936.

Extra Citrus Uses

BY-PRODUCTS that may make use of surplus citrus fruits in favorable crop years are being developed by the Department of Agriculture's Citrus Products Laboratory at Winter Haven, Fla.

In the four years since the laboratory was established, chemists there have shown that high quality salad oils, as well as solid fats, may be obtained from grapefruit seed, which is about one-third fat or oil. They have made splendid wines from citrus juices by adding sugar. They have made brandies and cordials from the wines. They have developed a method for canning orange juice with a "bite" approaching that of fresh juice, a method which also greatly improves the flavor and keeping quality of canned grapefruit juice.

"Whether or not major industries will come from these discoveries is a matter of economics," says Dr. Henry G. Knight, Chief of the Bureau of Chemistry and Soils.

Strawberries Can Be Profitable

(*From page* 16)

foliage a more moderate leafage which will admit both the light and air so necessary to the good development of fruit. The potash will also result in a tougher foliage less likely to suffer from dry periods and will add firmness and color to the fruit. Not to be discounted is the more sturdy root system that will develop from the addition of potash, a root system that will carry the plant over periods of weather stress in good order.

Mulching with wheat straw, salt, hay, or even pine needles, which are plentiful in most sections, will be found profitable and is of vital importance. It will keep the soil cool, which is most desirable with a plant as shallow rooting as the strawberry, and will prevent splashing of sand or other soil on the fruit during hard showers, resulting in clean, attractive fruit which commands better prices.

The package in which the fruit is shipped to market is of great importance. It has been customary for years to ship in a crate containing 32 to 60 quarts. Today the practical package contains 16 to 24 quarts. The smaller package is much easier to handle and less subject to shakeup and damage. Further, the trade that wants fancy fruit much prefers a smaller package. I used 24-quart crates when marketing Dorsett and Fairfax last spring and labeled each crate with an attractive label in actual color. This served as a trademark and held customers throughout the season. The "would be" new customers were unable to get our special mark, the result being that

prices held remarkably well even in the face of general market decline.

In my judgment, the future holds much for the market grower of strawberries, if he will do the little important things and grow the right varieties, and right varieties at our place now mean Dorsett and Fairfax, after a most profitable experience from growing them. I now lean to Dorsett as the leader of the two, at least for our section of the country.

Renovating Pastures

(*From page* 10)

legumes. There is some advantage in top-dressing with ground limestone a year in advance of the time of seeding, but this is not necessary except where the soil is extremely acid. Even in such a case, supplementing ground limestone with a quick-acting form of lime, such as limate (400 to 600 lbs. per acre), will eliminate the necessity of liming far in advance of seeding. Likewise, if marl or very finely ground limestone is applied, its reaction on very acid soils is sufficiently rapid for application just before cultivation of the sod. Lime, phosphate, potash, and other fertilizers are spread on top of the sod to be disked into the soil when the sod is worked up."

Reed canary grass, as a pasture and hay crop, is being grown successfully on lowland soils through the use of potash. E. D. Holden, crop specialist at the Wisconsin College of Agriculture, points out the necessity for supplying potash to the soil for getting good stands of canary grass. Mr. Holden says that on acid peats and mucks of the sandstone area, small applications of lime and fertilization with phosphate and potash, such as 0-9-27 or 0-8-32 at the rate of 300 to 400 pounds per acre, are desirable. On high-lime peats and mucks common in eastern Wisconsin, 200 pounds of 50 per cent potash per acre are usually enough to establish a stand.

Later applications can be made as top-dressings in early spring or just after cutting, when poor growth indicates the need. The requirement is likely to be at the rate of 75 to 125 pounds per acre a year, and this may be applied every two or three years. Some marshes may need phosphates.

We Did "Sumpin" About It

(*From page* 20)

manure salt and used it lightly over the spot. I had been skeptical about this side-dressing with potash but thought it wouldn't hurt to try in a small way. We did get some results but nothing to shout about. I know now that the land was so poor that it would have taken five times as much as we used to make any impression. The next year this field went to corn, and we did not bother about using any potash in side applications. But in the meantime, we planted the field to rye when the cotton had been picked, and plowed under the cover crop the next spring before planting the corn. There was a heavy crop of soybeans planted in with the corn and a great mass of stuff to plow under when we got the land ready for cotton in 1935.

That year, we top-dressed all of our cotton and corn with an application made up of 100 lbs. of nitrate of soda and 50 lbs. of muriate of potash. We had again used a 4-8-4 fertilizer be-

fore planting, and on the 18 acres of land to cotton we made 12 heavy bales of lint and one good remnant. We have enough corn in the crib to last us through until corn is harvested again in 1936. Some of our cotton had to be topped, and all of it produced a staple of over 15/16 of an inch in length. The sample was fine, creamy, and of a high quality.

The Problem Solved

It looks as if Robert and I have found out what to do about that field. We are not out of the woods yet, but we have pure seed for the whole farm; three young mules are paid for; there is a new mowing machine; we have some blooded Hampshire hogs and a purebred Guernsey bull; and this year we plan to fence in a good pasture. We have adopted the plan of seeding lespedeza on our small grain; rotating our crops each season; planting kudzu on our gullies; and planting a good crop of soybeans and cowpeas. Robert enjoys sweet potatoes, peanuts, wheat bread, black-eyed peas of his own production, and meat from his own pigs. I also have shared in some of these.

But we are building up our place. When we signed the adjustment contract, the committee searched our records and allowed us 147 lbs. of lint cotton per acre as our base. If Robert attends to all the spots, we shall make a bale to the acre this year. We didn't miss this goal very far last year in spite of a long, dry season followed by heavy rains and disastrous boll-weevil damage in September. I do not say that top-dressing with the potash and nitrate did all of this, because we have been putting something back into the land these past four years. Neither do I definitely promise to continue the use of potash in our side applications, because a farmer cannot always do all the things he thinks ought to be done.

But Robert told me last fall when we settled accounts, "Mr. Jeter, I think we got just about the kind of fertilizer and the acres to cotton and such that we want to grow on this farm. It suits me to keep on like we are going now, and if you can get some more of that potash to mix with our soda, it would be good." I told him I would, and I am, because what he has found out also has been learned by the agronomy department of the North Carolina Experiment Station in its research studies of potash deficiency or rust in the peanut belt and in other places over the state.

Mangels Respond to High Potash

(*From page* 18)

very high. It is significant, however, that with only one exception, the cost per ton of producing the crop on the potash-fertilized plots was considerably lower than that on the plots receiving no potash.

With the exception of the 600-pound application, the increases on the potash-fertilized plots ranged from 20 per cent to 50 per cent. The average yield of potash-fertilized plots was 19.94 tons per acre as compared to 14.69 for the check plots, an increase of 5.25 tons or over 35 per cent.

Taking into consideration the average figures for the three years, it is worthy of note that the smallest increases in yield were secured on the plots receiving the lowest applications of potash, namely, the plots receiving 300 and 400 pounds of potash. The increases in yield on these plots were 8.8 per cent and 14.7 per cent for the two plots. Aside from these two plots, the next smallest increase was 24.1 per cent over the check plot, on the plot receiving 900 pounds of potash. There has apparently been no

depressing effect on the yield as a result of the higher concentrations of potash. The lowest production costs per ton secured were on the plots receiving 500, 600, and 700 pounds of potash.

The potash applications giving the smallest increases in yield were far in excess of the amount usually applied or even recommended in western Washington. The 300 and 400-pound applications would be equivalent to 1,500 and 2,000 pounds of a complete fertilizer containing 10 per cent K_2O. Those applications giving the most economical production, namely, the 500, 600, and 700-pound applications, would be equivalent to 2,500, 3,000, and 3,500-pound applications of a complete fertilizer containing 10 per cent K_2O.

For the three-year period, all the check plots averaged 22.94 tons per acre as compared to 28.98 tons for all plots receiving potash. This is an increase of 6.04 tons per acre, or 26.3 per cent.

Data showing the yield, the relative production compared with the check plot, and the cost of production per ton of yield are presented in the accompanying table.

The data obtained in this study indicate that possibilities exist in securing economical results from the use of larger amounts of the fertilizer elements than those ordinarily used. The most important fact brought to light, however, is the importance of studying various concentrations of the several fertilizer elements, to and beyond the commonly accepted limit of economic value (since the light concentrations may prove less valuable than the heavier concentrations). It is only in this way that the real importance of the various elements to crop production can be determined. Conclusive results should not, however, be expected when only the chemical fertilizers are considered. It is important to determine the relationship of the chemical fertilizers to other phases of good soil management.

Organic materials, especially manures and cover crops, should form the basis for a soil fertility program, and for this reason a comprehensive study must consider not only the amounts of the various chemical elements which will give the most economical returns when used alone, but these elements as they may be needed to supplement the organic materials, and their place in the fertility program over a period of years.

YIELD OF MANGELS WHEN FERTILIZED WITH NITROGEN AND PHOSPHORUS PLUS VARYING APPLICATIONS OF POTASH

(Average of Three-year Period)

Pounds Muriate of Potash per Acre	Yearly Yield in Tons Per Acre			Three-year Average			
	1st Year	2nd Year	3rd Year	Tons per acre	Tons Increase	% of Check	Cost Per Ton
Check	26.85	27.24	14.69	22.94	....	100.0	$5.88
300	27.47	29.55	17.66	24.96	2.02	108.8	5.80
400	27.63	29.14	21.64	26.30	3.36	114.7	5.65
500	32.86	35.38	21.70	30.20	7.26	131.7	5.11
600	29.29	47.84	14.68	30.62	7.68	133.5	5.14
700	31.73	43.75	22.14	32.51	9.57	141.7	4.97
800	29.45	38.30	19.62	28.89	5.95	126.0	5.60
900	34.58	29.77	20.46	28.46	5.52	124.1	5.77
1,000	33.96	36.88	21.60	30.60	7.66	133.4	5.51
Average of All Potash Plots	30.87	36.34	19.94	28.98	6.04	126.3	$5.44

Humus, Fertilizers, and Plant Nutrition

(*From page* 22)

plant nutrition and the relation of humus to their functions have only recently been appreciated.

Fertilizer Theories

The old-time concept of a complete fertilizer was based upon the theory of ten essential elements, with three of them likely to be short in cultivated soils. With these three (N-P-K) supplied in the form of commercial fertilizer, in more or less standardized and acceptable ratios, the end of fertilization was supposedly complete. This mineral theory of fertility, to the extent that the number of minerals is limited, and the significance of humus in plant nutrition is overlooked, is inadequate. And that statement does not detract in any way from the importance of N-P-K in plant nutrition. Neither does it disregard the importance of lime in the nutrition of higher plants.

In modern terminology the reactive portion of the soil is a colloidal complex of mineral and organic matter in combination with the important nutrient bases, calcium, magnesium, and potassium. In normally good soils calcium is the dominant base in the complex. As long as there is enough calcium to maintain the complex near neutrality, the soil remains satisfactorily responsive to fertilization, crop rotation, and good management.

Strong soils carry not only a relatively high humus content, but a large percentage of reactive mineral complex. These soils are capable of holding a large reserve of nutrient material, and of giving up these nutrients as crops need them in growth.

Good soils due to bad management may become temporarily "run down," so that yields are unsatisfactory. Usually the "run-down" condition is principally a loss of humus, following too continuous cropping. Legumes and manure comparatively easily correct such a condition, and the soil becomes productive again.

But more serious things can happen to soils than simply loss of humus. Soils, like people, become aged and incapacitated. Old age in soils is partly physical, with the development of clay pan subsoils, associated with a general slowing down of processes and functions within the soil profile.

Old age brings on detrimental chemical changes in soils also. Due to prolonged leaching, the reactive mineral complex loses its bases, particularly the calcium and potassium. The bases are lost by replacement with hydrogen, resulting in soil acidity. As long as these exchanges of bases for hydrogen have not gone too far, the condition can be corrected by the addition of some form of lime.

Reclaim Degenerate Soils

But old age as applied to soils covers thousands of years, sometimes perhaps, millions. Some of our older soils were leached and wasted long before the coming of the white man. Aging is associated with excessive leaching and chemical weathering. The neutral calcium complex is quite stable, but the hydrogen complex at high acidities is unstable. Like a rotten house that finally collapses from its own decay, the hydrogen complex falls to pieces and cannot be restored. Such soils are not "run down," but the effect of evil days is deeper seated. The soil has "degenerated." Plant nutrients are gone, and the capacity to hold nutrients is likewise gone. This wasting process is carried to the extremest form in the humid tropics, where leaching has long continued. In the end little remains but the inert oxides of iron and aluminum.

Can "degenerated" soils be restored to fertility? To some extent and for certain uses. However, youthful

virility can no more be restored permanently to old soils than to old people. But the effects of age can be considerably alleviated. Along with the development of acidity in soil aging, there often occurs the liberation of toxins and phosphate precipitants which interfere with the nutrition of crops. Ferrous iron and aluminum may function in these capacities. Liming to some extent corrects these undesirable conditions. Where "degenerated" soils do not contain toxins and when the physical conditions are favorable, the soils have similar values for crop production as sands, and probably can be made productive by similar methods. Crops grown on sands because of their naturally low fertility must be largely hand fed, each crop fertilized liberally with complete fertilizer to insure good growth. An upbuilding program to raise such soils to a permanent, high-fertility level is impracticable.

Both sands and "degenerated" soils are effectively improved by attention to the renewal of the humus and lime. The most stable form of humus is calcium humate. Likewise, calcium humate is well suited to those processes and ends that favor the growth of higher plants. Rotting plant materials diluted with a certain amount of inert minerals, such as sand, and supplemented with such additional mineral nutrients as may be deficient, provide as nearly ideal conditions for the growth of crops as any medium yet observed. Peats are the most valuable garden and truck soils in existence. Moisture, aeration, permeability, penetrability, and biological activities all are very favorable for crop growth on peat soils.

Adequate humus renewal helps keep soils young. Humus helps hold fertility and makes fertilizers more effective. Humus holds the lime and keeps mineral plant foods circulating. Lime, likewise, helps to hold the humus and to preserve the neutrality and the integrity of the complex, thus maintaining its vigor and virility. Soils that are only "run down" are quickly brought back to productivity. Cropping "degenerated" soils necessitates more hand feeding, more liberal fertilization. Fertilization with mineral fertilizers and lime is necessary to grow more humus and to assure success with legumes. Adequate fertilization makes more roots, bigger stubble, and large crop and weed residues to return to the soil. Perhaps humus and fertilizers should be considered as complements rather than supplements in the scheme of fertility. Each has a specific place in the soil-building program, which the other cannot fill.

Morgan's Method

(*From page* 11)

few more acres were added in order to square off the field, and the entire acreage was then seeded to rye for a winter cover crop. The rye crop was turned under the following spring, being plowed the opposite way of the corn. No other preparation was made until the time for planting.

A comparison between fertilized and unfertilized rows, as well as small whole vs. large seed cut into good sized seed pieces, was planned. The variety used was Rural, and 500 pounds of a 2-8-16 per acre applied in the row was the fertilizer. A 2-row potato planter was used which spaced the potatoes evenly in the rows and at the same time distributed the fertilizer in narrow bands about 2½ inches away from the seed. The rows were 2½ feet apart, and the planting was completed on June 28. Small seed, No. 2 size, were used, and they were planted whole.

The first cultivation and spray followed after the plants were up about five inches, and a regular spray schedule was in force for the rest of the season. The vines remained green until killed by an early and unexpected frost the first of October.

Harvesting operations began on October 7, and a check was made on the corn plus rye vs. rye alone, the fertilized and unfertilized areas, and the small whole seed vs. large cut seed. Unfertilized potatoes yielded 136 bushels, cut seed 125 bushels (poor stand), rye alone (small whole seed) 280, and the corn plus rye 448 bushels. Very little scab or wire-worm damage was found in the corn plot.

Another interesting feature of the corn and rye plot was that over 82 per cent of the field-run potatoes graded U. S. No. 1's. No grade records were kept upon the other plots. His average was 367 bushels of No. 1's per acre from this method of growing potatoes.

Fertilizer Needs of Red Raspberries

(*From page* 14)

izer without potash, differences which can be noted even in the rather inadequate picture shown in Figure I.

The results secured in this preliminary experiment were sufficiently unexpected and striking, so that it seemed desirable to check results by a more elaborately laid out experiment on a somewhat different soil. Accordingly, a field was chosen on a farm two miles away, presenting a different site and a heavier type of soil.

Sixty 1/60-acre plats with greater intervals between plats were used, and check plats receiving no fertilizer were provided. As in the first experiment, there were unit series of four plats with a plat receiving complete fertilizer, and three plats receiving the same amounts of two fertilizer ingredients, but omitting in turn the third. Each series also had a check plat, and there were series providing for three levels in fertilizer applications; viz., 500, 1,000, and 1,500 pounds per acre, and three replications of each treatment.

Replications of the different treatments were located to take cognizance of known differences in natural fertility of the land and so that each treatment would be represented in the better portions of the field as well as in the poorer. Cultural methods, spraying, etc., followed the plan laid out for the first experiment. Only one variety, the Latham, was planted.

TABLE II. COMPARISON OF YIELDS IN KILOGRAMS OF TWO CENTRAL ROWS WITH TOTAL YIELDS FOR EACH PLAT.

Treatment	Total yield 3 years 4 varieties	Total yield two middle rows June and Herbert	Relative yield of central rows to total yield, in per cent
N-P-K All Three Elements	51.1 Base	13.2	26
N-K No Phosphoric Acid	42.3	10.5	25
P-K No Nitrogen	35.5	8.4	23
N-P No Potash	24.1	3.5	14

TABLE III. AVERAGE YIELD OF PLATS RECEIVING THE SAME FERTILIZERS, GENERAL AVERAGE AND 3-YEAR AVERAGE YIELD IN QUARTS PER ACRE AND PERCENTAGE OF YIELDS, UNDER DIFFERENT TREATMENTS, USING THE COMPLETE FERTILIZER PLATS AS THE BASE

Fertilizer treatment	Year	Yield per plat in kgms. for 3 levels of per acre applications 500 lbs.	1000 lbs.	1500 lbs.	General average for 3 years	Equivalent in quarts per acre	Per cent reduction
N-P-K Complete Fertilizer	1933	32.4	35.6	33.3	27.5	2,845	Base
	1934	25.1	27.1	19.2			
	1935	23.0	24.9	27.0			
N-K No Phosphoric Acid	1933	26.2	28.0	31.2	25.1	2,600	9
	1934	24.8	26.6	15.7			
	1935	21.9	25.7	26.2			
P-K No Nitrogen	1933	25.2	25.3	19.0	17.6	1,816	36
	1934	16.3	13.9	9.9			
	1935	18.6	19.2	10.7			
N-P No Potash	1933	19.9	17.4	17.7	12.5	1,294	55
	1934	13.9	7.2	8.9			
	1935	12.9	8.2	6.5			
Check No. Fertilizer	1933	16.7	9.7	11.4	9.7	1,005	64
	1934	8.5	7.8	7.6			
	1935	10.1	9.7	6.0			

In this experiment crops have been secured and results calculated for the years 1933, 1934, and 1935. These are summarized in Table III.

If we again take the plats on which a complete fertilizer was used as a base, we find that there is a 9 per cent decrease where phosphoric acid was left out, 36 per cent decrease where nitrogen was left out, and 55 per cent decrease where potash was omitted. There was a reduction of 64 per cent where no fertilizer was applied. Combining percentage results of the two experiments we have the comparison shown in Table IV.

After the second experiment was laid out, similar but more extensive experiments at the East Malling Station in England came to the writer's attention. This work was carried on between 1927 and 1931, and is reported by T. N. Hoblyn in the Journal of Pomology and Horticultural Science (Published in England) for December 1931. The opening sentence in this paper indicates that, regarding the status of their knowledge of raspberry fertilization, the author has arrived at a similar conclusion for England as that expressed for the United States in Bulletin 229 of the Rhode Island Experiment Station. To quote from page 303 of the Journal: "The manuring of raspberries is a subject concerning which there exists little experimental evidence. Although most textbooks recommend heavy dressings of organic manures, the evidence afforded by the few elementary

TABLE IV. COMPARATIVE YIELD IN KILOGRAMS AND PERCENTAGE OF REDUCTION DUE TO DIFFERENT TREATMENTS IN TWO EXPERIMENTS

Treatment	First experiment, Reduction in yield (Per cent)	Second experiment, Reduction in yield (Per cent)
Complete	Base	Base
N-K	17	9
P-K	30	36
N-P	53	55
Check	—	64

trials in which artificials are included, is not very illuminating."

The English experiment here referred to considered the growth of two varieties regarded as offering definite contrasts in growth habits, and used a total of 7½ acres as compared with a little over one acre in the second Rhode Island Experiment, and much less in the first. Further details of the English experiment cannot be given here, but the following statement from the summary, p. 329 of the Journal, indicates conclusions quite similar to those arrived at from the Rhode Island investigations.

"The results indicate that on this soil, with two varieties of very different habits, a proper balance between nitrogen and potash is the secret of successful manuring of raspberries. Nitrogen may up to a point produce more cane by itself, but has never increased the crop except in the presence of potash. Indeed, alone it has been depressing in both cases."

Results of the two Rhode Island experiments indicate quite definitely that on two soils of fair, natural fertility, growth and yield of raspberries under different fertilizer treatments show a very definite need of potash. Since these two types are fairly representative of Rhode Island soils, and as nearly identical results also have been secured from English experiments, it would seem reasonable to conclude that raspberries suffer decidedly from potash deficiency, and that this element should not be left out of the fertilizers unless careful experimental checks indicate that the soil to be used contains the requisite amount. Nitrogen is second in importance, and the current advice to apply it should be heeded. Phosphoric acid is of least importance, but since this element is relatively cheap it should be added if for no other purpose than to help produce a good cover crop, which is essential unless barnyard manures can be applied from year to year.

Potash for Cotton Wilt and Rust in South Mississippi

(*From page* 8)

addition of potash to a fertilizer containing adequate amounts of nitrogen and phosphate, the percentage of wilt was greatly reduced. The 50-pound per-acre application of muriate of potash in combination with nitrate of soda and superphosphate brought about a reduction in wilt infection of 65.18 per cent, but it was only when 100 pounds of muriate were used that the maximum reduction, 86.12 per cent, was reached. Increasing the application of muriate to 150 pounds per acre did not in this plat result in a further material reduction in infection, indicating that under the conditions of the test, 100 pounds were enough to satisfy the potash deficiency present.

The plat receiving no fertilizer whatsoever had a 42.35 per cent lower wilt count than did the one receiving both nitrate and phosphate but no potash. This may be accounted for, in all probability, by the explanation that the normal potash resources of the soil had been more rapidly depleted in the latter plat by the increased vigor and growth of the plants receiving the unbalanced fertilizer. This is, in itself, a further indication of the value of the potash in wilt control.

In consideration of yields secured, the exceedingly low yield of the check or no-fertilizer plat may be accounted for by the fact that it had received no fertilizer whatsoever since 1919. With each increase in potash up to 100 pounds per acre the yield was

TABLE II. EFFECT OF AMOUNT OF POTASH ON YIELD OF SEED COTTON AND ON WILT INFECTION AT THE POPLARVILLE BRANCH STATION, 1930-1932

Treatment: 800 lbs. per acre	Lbs. seed cotton per acre				% wilt infection			
	1930	1931	1932	3-yr. av.	1930	1931	1932	3-yr. av.
6-8-0	884	944	477	768.5	22.1	22.0	18.2	20.85
6-8-4	926	1,096	555	859.0	12.8	7.0	9.8	9.85
6-8-8	908	1,114	565	862.3	7.1	6.9	8.4	7.46
6-8-10	982	1,060	547	863.0	8.7	6.2	11.0	8.63
6-8-12	982	1,087	528	865.7	8.7	3.9	10.6	7.73
6-8-14	966	1,146	629	913.6	13.2	5.0	9.4	9.20

materially increased, that application giving an increase of 34.45 per cent over the plat receiving nitrate and phosphate but no potash, as compared with 20.96 per cent increase in yield for the plat receiving the 50-pound application of muriate. These results indicated clearly that with a variety of cotton which showed a moderate degree of resistance to wilt, the trouble may be largely overcome on the light soils of south Mississippi by the use of a sufficient amount of potash in a properly balanced fertilizer.

In Table II are presented the results secured from another test conducted at the same station designed to determine the amount of potash in combination with other fertilizer elements which would be most effective for wilt control in south Mississippi. A basic fertilizer, analyzing 6-8-0, to which muriate of potash in the proportions of 0, 4, 8, 10, 12, and 14 per cent was added, was applied at the rate of 800 pounds per acre. Nitrate of soda and superphosphate supplied the respective elements, nitrogen and phosphorus. The test was begun in 1928 and continued through 1932. The data for 1928 and 1929, however, in which years soil inoculations were made by the application of copious amounts of inoculum prepared by growing the wilt organism on wheat bran, were omitted, due to the fact that infection was not uniformly distributed in all plats.

Examination of the table shows that the difference in yield for the 3-year period on all plats receiving potash were not significant. Moreover, the variation in percentage of infection on the same plats is too small to have any particular significance. However, on the other hand, the reduction in wilt

In the foreground where no fertilizer was applied, the wilt infection was 42.2% and the yield only 180 lbs. of seed cotton. In the background on the left where 200 lbs. nitrate of soda, 400 lbs. superphosphate, and 100 lbs. muriate of potash were applied, the wilt infection was only 3% and the yield was 1,224 lbs. of seed cotton.

infection over the check plat, which received no potash but which in other respects was treated in identically the same manner, was quite marked in the case of each and every plat treated with potash. The indication was, therefore, that the 6-8-4 mixture at the rate of application used, namely, 800 pounds per acre, contained sufficient potash to reduce wilt infection to the approximate minimum to which it was capable of being reduced by the use of potash on the variety, Lone Star 65, under the conditions of the test. The plants receiving more than 4 per cent of potash did, in fact, show a slightly lower amount of wilt, but the differences were not large and the yields were not increased accordingly.

This test shows agreement with those previously discussed in indicating that, even with a resistant variety of cotton, the damage from wilt can be further reduced by the use of potash in the fertilizer mixture. Kainit showed the greatest decrease in wilt infection and also the largest increase in yield among the four potash sources tested, and the differences were large enough to be significant. This is especially true when taken into consideration with the fact that it has given similar results in other tests, conducted in a similar manner, but not reported herein. Kainit, being a natural mineral, contains as impurities the salts of several other elements in addition to potash, and it is entirely probable that these may have had an effect in stimulating the cotton plant and thereby affecting the yield and the reduced incidence of wilt.

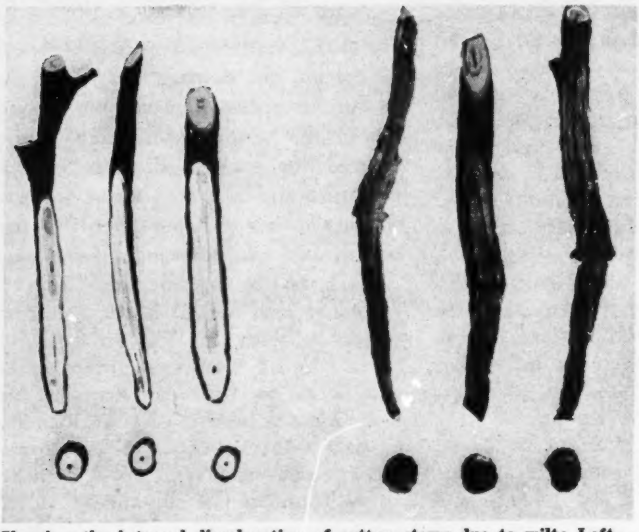
TABLE III. POTASH SOURCE TEST WITH REFERENCE TO COTTON WILT CONTROL AT THE POPLARVILLE BRANCH STATION, 1930-1932

Analysis	Source of potash	Lbs. seed cotton per acre				% wilt infection			
		1930	1931	1932	3-yr. av.	1930	1931	1932	3-yr. av.
6-8-0	.....	1,025	1,059	590	891.3	8.5	12.9	9.8	10.43
6-8-4	Muriate	1,090	1,243	448	927.0	1.2	5.0	5.3	3.83
6-8-4	Sulphate	1,164	1,142	660	988.6	1.6	8.5	2.0	4.03
6-8-4	Kainit	1,198	1,195	657	1,016.7	1.7	1.3	1.5	1.50
6-8-4	Sulphate of potash-magnesia	1,164	1,102	639	968.3	1.8	4.8	6.5	4.36

Table III presents the results secured in another test conducted at the Poplarville station between 1928 and 1932, inclusive, to determine whether any particular source of potash was more effective in the control of wilt than was another. Four sources of potash were tested, namely, muriate of potash, sulphate of potash, kainit, and the double salt, sulphate of potash-magnesia. The basic fertilizer was a 6-8-0 mixture applied at the rate of 800 pounds per acre, and the potash added from the various respective sources was always in the proportion of 4 per cent. Results for 1928 and 1929 were omitted from the table for the same reason as recorded in the previous test. The variety used was a strain of D. & P. L. cotton which was relatively resistant to wilt, consequently the percentage of infection on all plats was rather low.

The land selected for the tests was that on which severe losses had been experienced in previous years from a combination of wilt and rust or potash hunger. Nematodes were not present to an extent that they might become a complicating factor in the interpretation of the results secured. In each case rust was controlled by applications of potash, as was evidenced by the thriftier growth, deeper green color of the cotton, and by the absence of defoliation. In each case where nitrogen and phosphorus were applied without potash, the symptoms of rust were even more severe than on the non-fertilized plats.

The results secured from the series



Showing the internal discoloration of cotton stems due to wilt: Left—healthy; right—diseased.

of tests and from others of a similar nature which are not reported herein present a sound basis for practical recommendations for dealing with the combination of wilt and rust, which is so troublesome to cotton growers in south Mississippi. Rust can be controlled by the use of a fertilizer containing an adequate amount of potash. Other tests have indicated that measures to increase the humus content of the soil, such as the use of barnyard manure and the growing and plowing under of leguminous cover crops, are also beneficial in the control of rust. For wilt control a suitably adapted variety of cotton should be selected which shows at least a moderate degree of resistance to wilt. Other factors being equal, the higher the degree of resistance shown by the variety used, the more satisfactory will be the control of the wilt which is secured. If wilt is present a larger proportion of potash in the fertilizer mixture than that required for the control of rust alone will be found to be beneficial.

If these recommendations are generally followed throughout the region indicated, losses from rust and wilt of cotton should be held in check and should become of negligible importance. A continued high loss from these troubles on the part of a grower or a community will merely mean that adequate use is not being made of remedial measures already available with which to combat them.

Spring Song

(*From page 5*)

one's pockets and stand on his head to make them out.

One reason for the persistent popularity of our midwest minstrels lies in their direct simplicity and their musical rhythm. Leave out financial reward altogether, please, as I speak of satisfaction begot by understanding and something else linked with the folk-lore of our land. I must call in a stauncher authority than myself to support and clarify my claim. No other than Gilbert K. Chesterton, English scholar and critic, has written the following, and as I cannot beat it myself, here it is:

"The historical point about rhyme is that it rose out of the Dark Ages with the whole of this huge popular power behind it—the people's love of

a song, a riddle, a proverb, a pun, or a nursery jingle; the sing-song of innumerable children's games, the chorus of a thousand camp-fires and a thousand taverns. When poetry loses its link with all these people, it loses all its power of giving pleasure."

GOOD poetry in any season is an expression of mood or state of mind, and it should not require a piece of research in order to get its effect. I blame some of my diligent high-school teachers for getting the "college analysis" habit too early when they helped us out of short pants into the charmed circle of Shakespeare, Sir Walter Scott, and Milton. Many a fellow with an ear for good poetry and a flair for metrical excellence has had it all dusted out of him after a high-school course in English literature. Not hankering for history or archeology, he had to swallow so many foot-notes and hunt up so many tedious explanatory references that he missed the pleasant sailing of the poem itself.

Too frequently we regard poetry as a distasteful task involving too much mental strain, and I fear a reason for much of that avoidance of verse among us adults lies in those unhappy experiences of our adolescence.

If the small town high school had its shortcomings, these were often offset by the policy of the local newspaper. Rural weeklies used to welcome the home-town bard, if he kept his outpourings within decent space limits.

I understand, however, that things are different now, and that cash column rents are charged to poets on the same rate-card basis with baby-chick and ash-hauling notices. It is hard to tell whether this denotes poorer production or better public taste, and it may even afford grounds for political platforms designed to free genius from the shackles of capitalism. I may interview one of my old printshop foremen some day and get his reactions on the matter.

I find this an interesting study, for my first job was taken with the thought that the open door of the country printing office would give free rein in time to my muse and enable me to compose verse and actually see it in type. Bret Harte tells the same story in his yarn about the Poet of the Sierras, who lingered around the local sanctum with sentimental ballads for possible publication. For a time it was my privilege—amounting to license—to run a column of town topics layered in among the boiler plate of our weekly beacon. Standing at the case with stick and rule, I composed couplets and stuck up sonnets for my little world to read. I have no doubt that the citizens read them because there wasn't much else in the sheet except medicine ads which carried any degree of literary abandon or creative imagery. Not being a true Bohemian, I got no further in the fields of rhetoric and soon turned to facts instead of fancies—a plan I now adhere to most of the time.

PERHAPS my only sore spot as regards the whole poesy business has its roots in a winter I spent imprisoned in a claim shanty on the Dakota plains, with a retired circuit-riding widower, an elder of some kind of reformed church or other, as my nearest neighbor.

He did not play solitaire or read French novels, so it was his custom to while away his hours of weary waiting for preemption day in a highly ingenious way. That is, he arose early along with the prairie larks, and gulping a hasty breakfast, he brought himself and his satchel of unpublished poems over to my cloister for a day of indulgence—for him. I can see him yet, lean and ascetic, with a prodigious beard that would have made Aaron look like one of the quintuplets, gesturing grandly as he

chanted aloud to me his cantos and his octosyllabic quatrains. His age and calling saved us both that winter from the horrid effects of sudden violence.

Long before spring I had thought of a better way to save myself. It simply consisted of feverish night work building back-fires of verse gleaned partly from imagination and somewhat from the aforesaid novels; and after I insisted on reading them to him repeatedly, he withdrew in dudgeon and never returned. I do not know to this day whether it was the raw state of my muse or his own being drowned out that turned the tide for me.

HOW any minister of the gospel could substitute his own feeble efforts for the noble verses in the Book with which he must have been familiar, is another thought, and one which takes me into my final theme.

In naming any poem as one's favorite, some logical reason may or may not be required. I shall give a reason in my case because the particular verses connect themselves with a major part of my life work, and besides, the ones I shall quote reflect the spirit of this present season in a way that most of our clients will appreciate for the same reason that I select them.

To one whose privilege it has been to go afield each spring seeking the wisdom of the farmers and taking their problems to heart without any of the financial risks or rewards, but purely in quest of truth for others to read, the selection below is doubly appealing.

I nominate the following from the Songs of Solomon as worthy of new reading and perhaps as the best of all Bible verses to ask the dominie to read for us "extension" men when we leave for our last trip, because it will express smoothly and poetically the animating force that kept us akin to agriculture. And moreover, it is another "spring song," and therefore welcome for the time and purpose in hand.

"My beloved spake, and said unto me, Rise up, my love, and come away. For lo, the winter is past, the rain is over and gone;

"The flowers appear on the earth; the time of the singing of the birds is come, and the voice of the turtle is heard in the land.

"The fig tree putteth forth her green figs, and the vines with the tender grape give a good smell. Arise, my love, my fair one, and come away.

"Awake, O north wind; and come, thou south wind, blow upon my garden that the spices thereof may flow out. Let my beloved come into his garden and eat his pleasant fruits.

"Come, my beloved, let us go forth into the fields; let us lodge in the villages.

"Let us get up early to the vineyards; let us see if the vine flourish, whether the tender grapes appear, and the pomegranates bud forth; there will I give thee my love.

"And at our gates are all manner of pleasant fruits, new and old, which I have laid up for thee, O my beloved."

And after all, writing good poetry is not perhaps as hard as living it. We who foregather with the best farm folks under the sun know that they are the salt of the earth and the spice of our living. If faith and nobility have any place in rating good poems, I am sure that hosts of our familiar friends are standing like heroic stanzas themselves.

But this year as we hear the opening chords of the agricultural overture across the meadows and in the rural meeting places, there seems luckily and happily, a sweeter and a more lilting cadence in the melody than we heard last year and for several years.

I have it at last! There is less of the *penseroso* and more of the *allegro* in the Spring Song of 1936.

Aerial view of hoist and grinding plant at the U. S. Potash Company's mine near Carlsbad, N. M.

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"ALREADY BLOWED"

A certain middle-aged spinster has a vivid memory of Texas courtesy.

She was struggling with a hot cup of coffee in a small-town railway station, trying to gulp it before the train pulled out. A cowboy, seated a couple of stools away, noted her plight, and seeing the guard waving to the woman, came to the fore.

"Here, ma'am, you can take my cup o' coffee. It's already saucered and blowed."

"Well, Mose, how is your better half this morning?"

"She's better, thanks, sah; but boss, you shore is careless with your fractions."

She was young and attractive and spending her vacation in the country.

Walking in the woods one hot summer's evening she came to a beautiful lake. It looked so cool and inviting, and so isolated from the village that she decided to take a chance and go for a swim.

Presently a rustling was heard in the bushes along the bank. "Who's there," she called nervously. "Willie Smith," came back the reply in a high pitched voice. "How old are you, Willie?" she asked.

"Eighty demmit!" the voice replied.

A new clerk dictating a few days ago, was in doubt as to the use of a certain phrase, so he said to the stenographer: "Do you retire a loan?" And the wistful eyed one replied rather sleepily:

"No, I sleep with mama."

Traffic Cop: "Don't you know what I mean when I hold up my hand?"

Lady-driver: "I should. I've been a school teacher for 25 years."

"He was kicked out of school for cheating!"

"How come?"

"He was caught counting his ribs in a physiology exam."

WHY NOT?

Sandy joined a golf club and was told by the professional that if his name was on his golf-balls and they were lost, they would be returned to him when found.

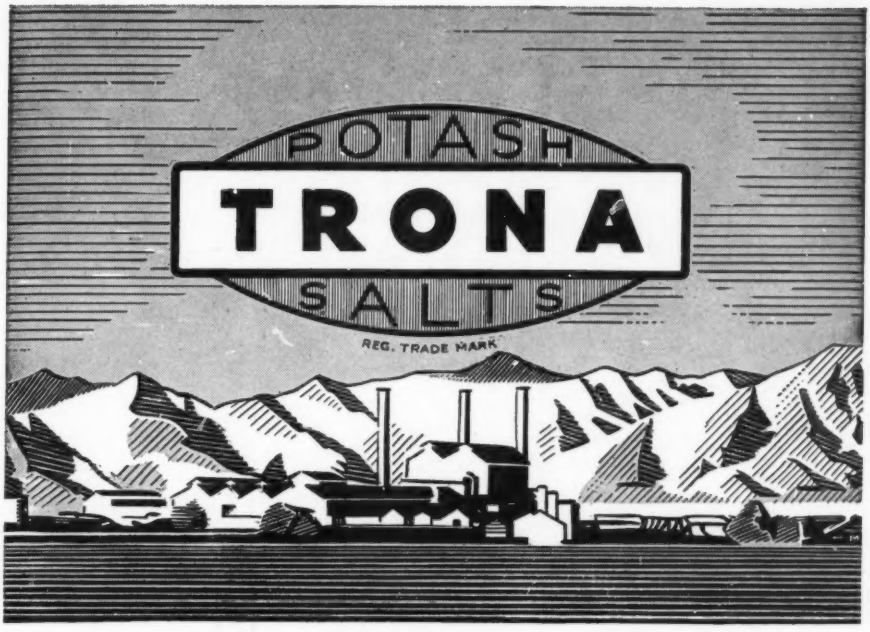
"Good," said the Scot, "put my name on this ball."

The pro did so.

"Would you also put M.D. after it?" said the new member. "I'm a doctor."

The pro obeyed.

"There's just one more thing," went on the Scot. "Can ye squeeze 'Hours 10 to 3' on as well?"



Trona on Searles Lake, California

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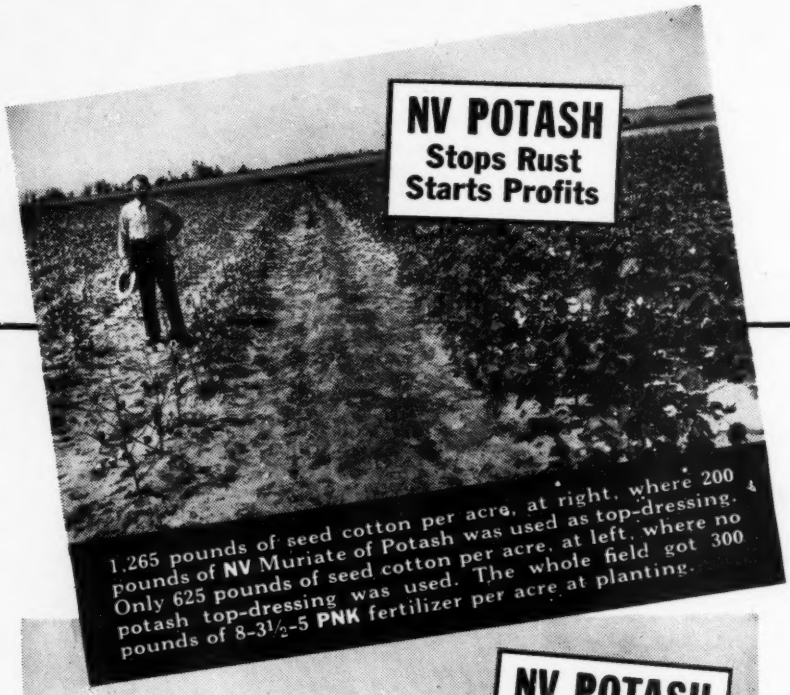

1,265 pounds of seed cotton per acre, at right, where 200 pounds of **NV** Muriate of Potash was used as top-dressing. Only 625 pounds of seed cotton per acre, at left, where no potash top-dressing was used. The whole field got 300 pounds of 8-31½-5 **PNK** fertilizer per acre at planting.

1,293 pounds of seed cotton per acre, at right, where 200 pounds of **NV** Muriate of Potash was used as top-dressing. Only 665 pounds of seed cotton per acre, at left, where no potash top-dressing was used. The whole field got 250 pounds of 10-5-5 **PNK** fertilizer per acre at planting.

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